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Technical Handbook

Alcatel 1692MSE

8 Channels CWDM System

1692MSE REL 2.0

1AA 00014 0004 (9007)A4

ALCATEL

3AL 97765 AAAA ED.02

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1692MSE REL.2.0 TECHNICAL HANDBOOK

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HANDBOOK GUIDE

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1 HANDBOOK STRUCTURE AND CONFIGURATION CHECK

1.1 General information

ALCATEL makes no warranty of any kind with regards to this manual, and specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. ALCATEL will not be liable for errors contained herein or for damages, whether direct, indirect, consequential, incidental, or special, in connection with the furnishing, performance, or use of this material.

NOTICE

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1.2 Handbook applicability

This handbook applies to the following product-release:

Product	Release	Version	ANV P/N	Factory P/N
1692MSE	2.0	01	3AL 97502 BAAA	

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1.3 Product-release handbooks

The list of handbooks given here below is valid on the issue date of this Handbook and

Some of the handbooks listed here below may not be available on the issue date of this Handbook.

The standard Customer Documentation in the English language for the equipment whose product-release-version is stated on the manual's front page consists of the following handbooks:

Table 1. Handbooks related to the product's hardware

Ref	Handbook	ANV Part No.	Factory Part No.	This HDBK
[1]	1692MSE Rel.2.0 Technical Handbook	3AL 97765 AAAA		
	Provides information regarding Equipment description, Maintenance, documentation.			
[2]	1692MSE Rel.2.0 Installation Handbook	3AL 97766 AAAA		
	Provides step by step procedural instructions for unpacking, inspecting, Alcatel Part Number, assembling mounting and wiring bays, sub-frames, I/O panels, ancillary items, and cabling.			
[3]	1692MSE Rel.2.0 Turn-Up & Commissioning Handbook	3AL 97767 AAAA		
	Provides procedures to support module installation, Alcatel Part Number and provisioning.			

Table 2. Documentation on CD-ROM

Ref	Handbook	ANV Part No.	Factory Part No.	This HDBK
[4]	1692MSERel.2.0 CD-ROM-DOC EN	3AL 97768 AAAA		
	Contains, in electronic format, the following handbooks: REF. [1] to [3] Envisaged after the release of all handbooks			

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1.4 Handbook Structure

This handbook has been edited according to the suggestions given by the "Code of Practice" for Instruction Handbooks issued by the European Broadcasting Union (EBU RECC. R29/82).

This handbook is divided into the following main topics as described in the table of contents:

HANDBOOK GUIDE: This section gives information on the whole handbook application, composition and evolution. Moreover it lists the handbooks that the Operator should have in order to carry out the tasks allowed by the specific product-release this handbook refers to. It contains general information on safety norms and type of labels that might be affixed to the equipment.

DESCRIPTION: It contains all the equipment's general and detailed system features including its application in the telecommunication network. Furthermore, it supplies the equipment description and specifications (i.e., system, mechanical, and optical).

MAINTENANCE: It contains the periodic checks and restoration to normal operation through the removal of faulty units and their replacement with spares**.**

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1.5 Handbook configuration check

1.5.1 List of the editions and modified parts

The following table indicates the handbook parts new or modified with respect to the previous edition.

Legend

"N" =New part
"M" =Modified part
" " =Not changed
"-" =Not applicable

Table 3. Handbook configuration check

EDITION		Rel1.0 01	Rel1.0 A3 01	Rel1.1 01	Rel1.2 A 01	Rel1.2 A1 01	Rel1.4 01	Rel2.0 01	Rel2.0 02
DESCRIPTIONS		N	M	M	M	M	M	M	M
1	FUNCTIONAL DESIGN	N	M	M	M	M		M	-
2	MECHANICAL DESCRIPTION	N	M	M	M			M	-
3	UNITS DESCRIPTION	N	M	M	M		M	M	M
OPERATOR'S HANDBOOK		N	M	M	M	M	M	-	-
4	1692MSE MANAGEMENT	N	M	M	M			-	-
5	THE GRAPHICAL USER INTERFACE	N	M	M	M	M	M	-	-
6	CONFIGURATION	N	M	M	M	M	M	-	-
7	SUPERVISION	N	M	M	M			-	-
8	ALARM HANDLING	N	M	M	M		M	-	-
9	PERFORMANCE MONITORING			N	M			-	-
MAINTENANCE		N	M	M	M			M	M
10	MAINTENANCE	N	M	M	M			M	M
11	OPERATION ADVICES	N	M	M	M			-	-
ANNEX			N	M	M			-	-

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1.5.2 Notes on Release 1.0 ED.01

Release 1.0 Ed.01 created on May 15th, 2003 is the first validated and officially released issue.

This document contains the technical documentation and the user manual for the 1692MSE release 1.0.

1.5.3 Notes on Release 1.0A3 ED.01

Release 1.0A3 ED.01 created on November 29th, 2003 is the second validated and officially released issue for 1692MSE system.

This document contains the technical documentation and the user manual for the 1692MSE release 1.0A3.
The release 1.0A3 contains the same features contained in release 1.0, plus the following features:

- House keeping and Remote alarm interface management
- New Wavelength adapter management
- New OMDX and OADM management

The following contents have been modified compared to Release 1.0 ED.01:

- Configuration in Operator's handbook
- Alarm handling in Operator's handbook

1.5.4 Notes on Release 1.1 ED.01

Release 1.1 ED.01 created on January 3rd, 2004 is the third validated and officially released issue for 1692MSE system.

This document contains the technical documentation and the user manual for the 1692MSE release 1.1.
The release 1.1 contains the same features contained in release 1.0A3, plus the following features:

- Intershelf link master and intershelf link slave management
- New Wavelength adapter management
- New OMDX and OADM management
- Multi-shelves managed as one NE
- B&W SFP module used in C-4xANY
- Performance monitoring
- Back-to-back configuration as 1 NE
- Security management
- MIB backup & Restore
- Alarm Severity configurability

The following contents have been modified compared to Release 1.0A3:

- Configuration in Operator's handbook
- Alarm handling in Operator's handbook
- Function design and system configuration in technical handbook

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1.5.5 Notes on Release 1.2A ED.01

Release 1.2A ED.01 created on August 10th, 2004 is the fourth validated and officially released issue for 1692MSE system.

This document contains the technical documentation and the user manual for the 1692MSE release 1.2A.
The release 1.2A contains the same features contained in the release 1.1, plus the following features:

- The application of low cost WLA (named WLA1A)
- The application of Centre Office shelf (for short: CO shelf)
- Laser force on/off

The following contents have been modified compared to Release 1.1:

- Configuration in Operator's handbook
- Function design and system configuration in technical handbook

1.5.6 Notes on Release 1.2A1 ED.01

Release 1.2A1 ED.01 created on December 10th, 2004 is a new validated and officially released issue for 1692MSE system.

This document contains the technical documentation and the user manual for the 1692MSE release 1.2A1.

The release 1.2A1 contains the same features contained in the release 1.2A, plus the following features:

- The application of B-SNCP
- The application of user defined SFP

The following contents have been modified compared to release 1.2A:

- Functional design
- Operator's handbook

1.5.7 Notes on Release 1.4 ED.01

Release 1.4 ED.01 created on March 10th, 2005 is a new validated and officially released issue for 1692MSE system.

This document contains the technical documentation and the user manual for the 1692MSE release 1.4.

The release 1.4 contains the same features contained in release 1.2A1, plus the following features:

- Abnormal conditions List (forced Protection, Loopback and forced Laser State)
- Editing field (39 bytes long) for all the SFP
- Display indication about main and spare ports of protection
- Loopback warning message for adding/removing confirmation
- The application of WLA2 in CO shelf

The following contents have been modified compared to release 1.2A1:

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- About the Graphical User Interface in Operator's handbook
- Configuration in Operator's handbook
- Alarm handling in Operator's handbook

1.5.8 Notes on Release 2.0 ED.01

Release 2.0 ED.01 created on June 1st, 2005 is a new validated and officially released issue for 1692MSE system.

This document contains the technical documentation for the 1692MSE release 2.0.

The release 2.0 can be operated under hardened temperature.

The following contents have been modified compared to release 1.4:

- Unit configuration, mechanical configuration and function design
- Routing maintenance

1.5.9 Notes on Release 2.0 ED.02

Ed.02 created on May 25th, 2006, is the second validated and officially released issue of this Handbook. The following content are upgraded:

- Applications for R2.0
- Description of OAD and MDX boards used in R2.0
- FIT information

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2 COMPLIANCE WITH EUROPEAN NORMS.

Table 4. References and standards

Ref.	Standard Document	Date	Description
[1]	ITU-T Recommendation G.652	04/97	Characteristics of single mode optical fiber cable
[2]	ITU-T Recommendation G.653	04/97	Characteristics of dispersion shifted optical fiber cable
[3]	ITU-T Recommendation G.655	10/96	Characteristics of non-zero dispersion shifted optical fiber cable
[4]	ITU-T Recommendation G.664	03/99	Optical safety procedures and requirements for optical transport systems
[5]	ITU-T Recommendation G.694.2	10/03	Spectral Grids for WDM Applications: CWDM Wavelength Grid
[6]	ITU-T Recommendation G.695	10/03	Optical interfaces for Coarse Wavelength Division Multiplexing applications
[7]	ETS 300 019-1-1	05/94	Environmental conditions and environmental tests for telecommunication equipment
[8]	ETS 300 119	01/94	European Telecommunication Standards for Equipment Practice
[9]	ETS 300 232 A1	06/93	Transmission and multiplexing: Optical interfaces for equipment and systems relating to the Synchronous Digital Hierarchy
[10]	ETS 300 386	12/94	Public Telecommunication Network Equipment - Electro-Magnetic Compatibility Requirements
[11]	IEC 950	04/99	Safety of Information Technology Equipments
[12]	GR - 63 - CORE	10/95	Network Equipment - Building System (NEBS) Requirements: Physical Protection
[13]	GR - 1089 - CORE	10/97	Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunication equipment
[14]	SMPTE 292M-1998	98	Television - Bit Serial Digital Interface for High-Definition Television Systems

2.1 Safety

The equipment operates in the following environment:

- Telecommunication center
- Outdoor Cabinet

Compliancy to Safety Norms is claimed in that the equipment satisfies standardized Norms:

- IEC 60950 (1993) +A1 +A2 +A3 + A4

2.2 Environmental constraints

Compliancy to Environmental Norms is claimed in that the equipment satisfies standardized Norms:

- ETSI EN 300 019-2-1: 2000, hazard level 1.2: Storage
- ETSI EN 300 019-2-2: 1999, hazard level 2.2: Transportation
- ETSI EN 300 019-2-3: 1999, hazard level 3.3: Operating condition

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3 SAFETY NORMS AND LABELS

3.1 General rules

- Before carrying out any installation, turn-up, tests & operation and maintenance operations carefully read the relevant Handbooks and chapters.

- Observe safety rules

  - While equipment is operating no one is allowed to have access to the equipment parts that are protected by Cover Plate Shields that are removable with tools.

  - In the case of absolute need to have access to the equipment parts while it is operating, ONLY service personnel are allowed such access. By Service Personnel or Technical assistance it is meant:
    "Personnel which have adequate technical knowledge and experience necessary to be aware of the danger that they might face in carrying out an operation and of the necessary measure to reduce or minimize the danger to themselves and to others".

    The Service Personnel can only replace the faulty units with spare parts.

    The Service Personnel are not allowed to repair: hence the access to the parts not specified is not prohibited.

  - For the eventual cleaning of the external parts of the equipment, absolutely do not use any inflammable substance or substances, which in some way may alter the markings, inscriptions etc.

  - It is recommended to use a slightly damp cleaning cloth.

- The Safety Rules stated in the handbook describe the operations and/or precautions to observe to safeguard service personnel during the working phases and to guarantee equipment safety, i.e., not exposing persons, animals, and things to the risk of being injured/damaged.

- The safety rules described in this handbook are distinguished by the following symbol and statement:

SAFETY RULES

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3.2 Labels indicating Danger, Forbiddance, Command

It is of utmost importance to follow the instructions printed on the labels affixed to the units and assemblies.

The labels are fully compliant with International Norms ISO 3846-1984. The symbols or statements are enclosed in geometric shapes: ISO 3864-1984.

CONTAINS A SYMBOL STATEMENT INDICATES FORBIDDANCE (WHITE BACKGROUND WITH RED RIM - BLACK SYMBOL OR STATEMENT).

IT IS A COMMAND (BLUE BACKGROUND - WHITE SYMBOL OR STATEMENT).

CONTAINS A SYMBOL INDICATES WARNING OR DANGER (YELLOW BACKGROUND - BLACK SYMBOL AND RIM).

CONTAINS A STATEMENT PROVIDING INFORMATION OR INSTRUCTION (YELLOW BACKGROUND - BLACK STATEMENT AND RIM).

The labels have been affixed to indicate a dangerous condition. They may contain any standard-known symbol or any statement necessary to safeguard users and service personnel against the most common dangers, specifically:

- Harmful optical signals
- Moving mechanical parts

Pay attention to the information stated in the following, and proceed as instructed.

The symbols presented in para.3.3 through 3.4 are all the possible symbols that could be present on Alcatel equipment, but are not all necessarily present on the equipment this handbook covers.

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3.3 Harmful optical signals

3.3.1 Labeling

If the assembly or unit is fitted with a LASER, the labels must comply with the IEC 60825-1-1993 International Norms.

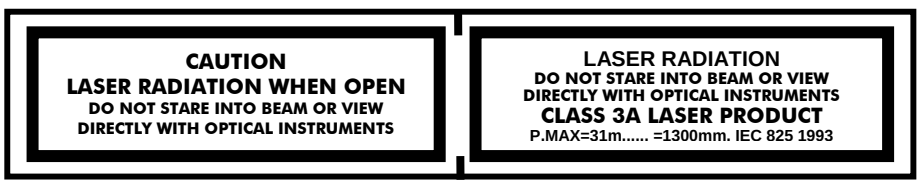
The symbol indicates the presence of a LASER beam. Danger level is stated within a rectangular label:

If the LASER is a class 1 product, the label depicting the symbol within a triangle is not compulsory.

The rectangular shaped label bears all the information needed, i.e.:

- LASER class
- Power emitted
- Wavelength
- Ref. Norm
- Precautionary measures taken depend on LASER class
- Indications given on openings, panels and safety interlocks

Take Class 3A as an example:


CAUTION
LASER RADIATION WHEN OPEN
DO NOT STARE INTO BEAM OR VIEW
DIRECTLY WITH OPTICAL INSTRUMENTS
LASER RADIATION
DO NOT STARE INTO BEAM OR VIEW
DIRECTLY WITH OPTICAL INSTRUMENTS
CLASS 3A LASER PRODUCT
P.MAX=31m..... =1300mm. IEC 825 1993

Example of power and length

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3.3.2 Optical safety: general rules

When handling optical equipments or units or cables always check that laser labels are properly affixed and that the system complies with applicable optical standards.

DANGER! Possibility of eyes damage: Invisible infrared radiations emitted by the fiber optic transmitters can cause eyes damage. Carefully observe the specific procedures for installation / turn-up and commissioning / maintenance of units containing laser devices or cables transporting optical signals, described in the relevant installation / turn-up and commissioning / maintenance documents and the following general rules:

a) Laser radiation is not visible by the naked eye or with laser safety glasses. Although it cannot be seen, laser radiation may be present.

b) Never look directly into a not terminated fiber optic connector or into a broken optical fiber cable, unless it is absolutely known that no laser radiation is present.

c) Never look at an optical fiber splice, cable or connector, unless it is absolutely known that no laser radiation is present.

d) All optical connectors, terminating either fibers or transmitters/receivers, are provided with protective covers that must always be used, as soon as possible, when any optical link is disconnected for installation/test/maintenance purposes or whatever operation.

e) Never look directly into a not terminated fiber optic connector or into a broken optical fiber cable by means of magnifiers/microscopes, unless it is absolutely known that no laser radiation is present. A magnifier/microscope greatly increases the damage hazard to the eyes.

f) Never point a not terminated optical fiber splice, cable or connector at other person, unless it is absolutely known that no laser radiation is present.

g) Wearing of laser safety goggles or eye shield is recommended for every person working on optical devices, whenever the above listed rules cannot be followed.

3.3.3 Optical safety: equipment specific data

Refer to para 1.6.

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3.4 Moving mechanical parts

The following warning label is affixed next to fans or other moving mechanical parts:

Before carrying out any maintenance operation sees that all the moving mechanical parts have stopped.

4 OTHER NORMS AND LABELS

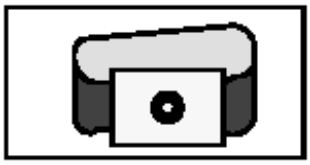
4.1 Electrostatic Dischargers (ESD)

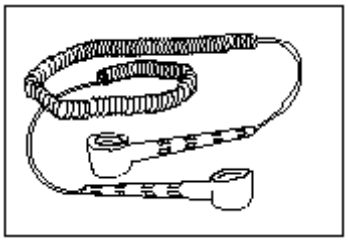
Before removing the ESD protections from the monitors, connectors etc., observe the precautionary measures stated. Make sure that the ESD protections have been replaced after having terminated the maintenance and monitoring operations.

Most electronic devices are sensitive to electrostatic discharges. To address this concern the following warning label has been affixed:

Observe the precautionary measures stated when having to touch the electronic parts during the installation/maintenance phases.

Workers are supplied with antistatic protection devices consisting of:





- An elastic band worn around the wrist.
- A coiled cord connected to the elastic band and to the stud on the shelf.

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4.2 Suggestions, notes and cautions

Suggestions and special notes are marked by the following symbol:

Suggestion or note…

Cautions to avoid possible equipment damage are marked by the following symbol:

Title…

(Caution to avoid equipment damage)

Statement…

4.3 Labels affixed to the Equipment

This paragraph indicates the positions and the information contained on the identification and serial labels affixed to the equipment.

Labeling depicted hereafter is for indicative purposes and could be changed without any notice.

Table 5. Label references

Ref. No.	Name of Label
1	Label specifying item on catalogue (P/N)
2	Serial number of item specified on catalogue
3	Final test certificate
4	Simple label adhered on extraction handle
5	Hazard level label

On contract basis, customized labels can be affixed to the equipment.

Standard labels can be affixed to any position on the equipment, as required by the customer.

However, for each of the above are applied the rules defined by each individual customer.

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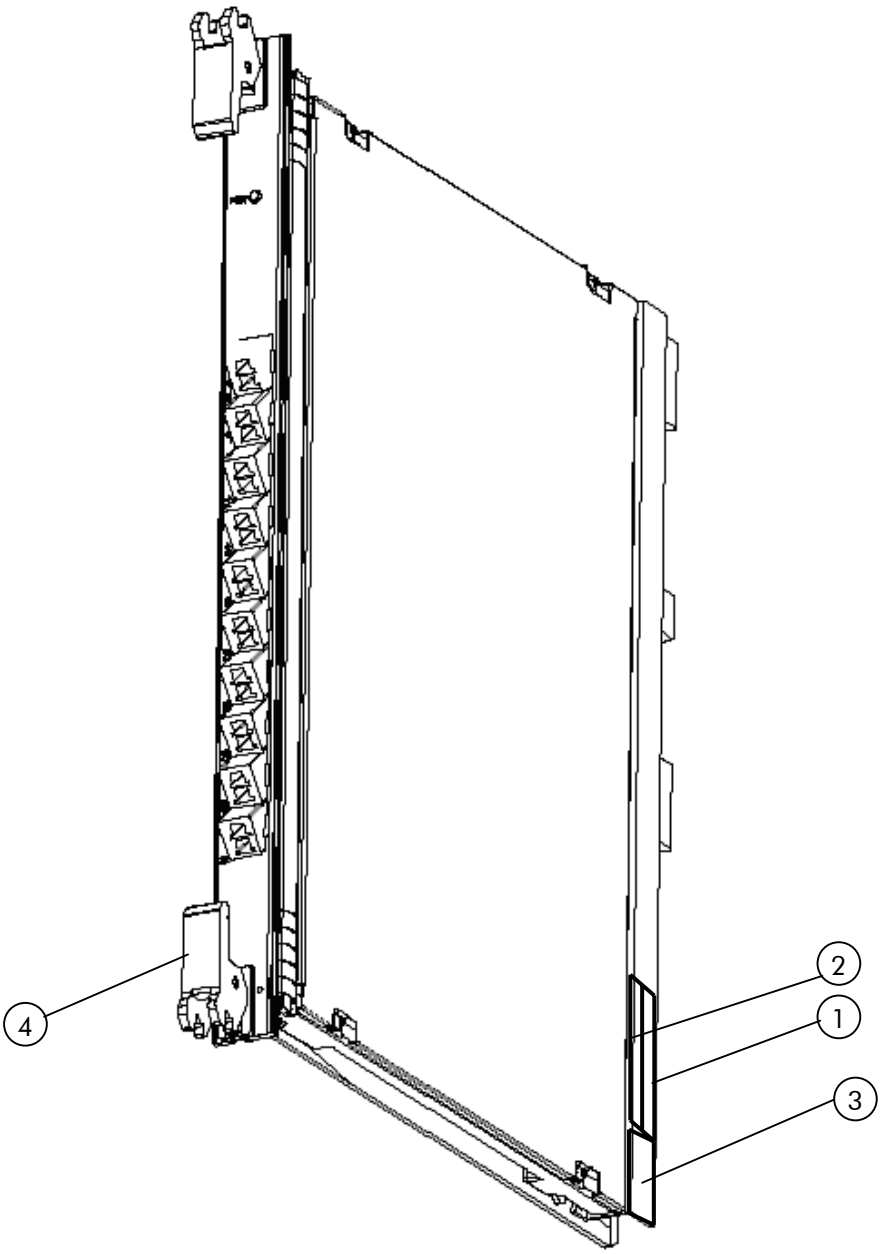

Figure1. Labels for units with stiffening bar

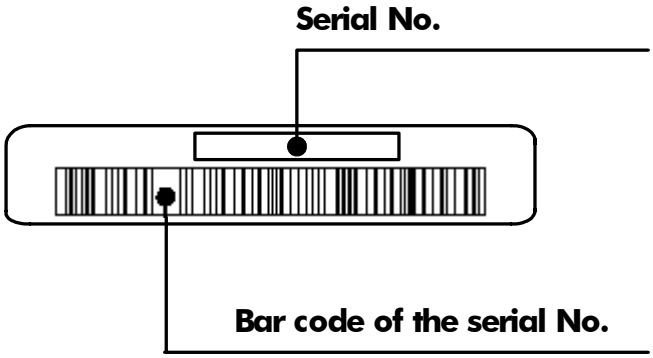

Figure2. Label specifying serial No.

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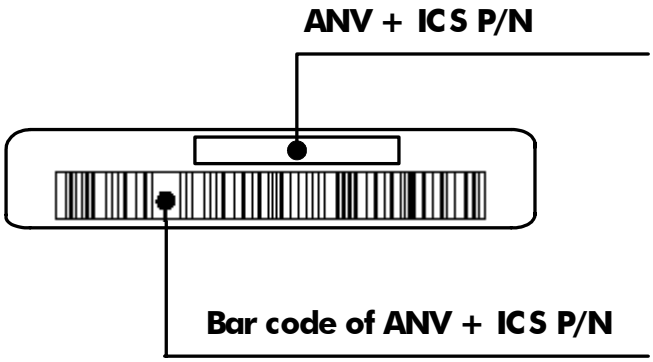

Figure3. Label identifying label on catalogue

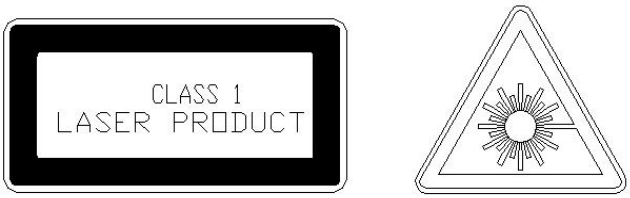

Figure4. Labels specifying hazard level

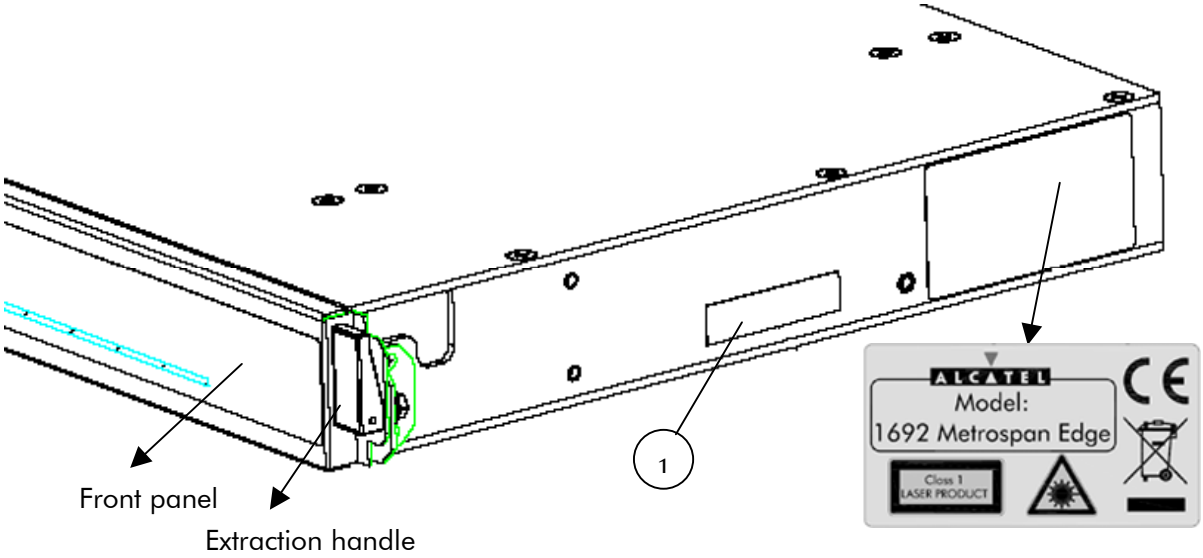

Figure5. Labels on the shelf (example)

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5 LIST OF ABBREVIATIONS

ADM
Add & Drop Multiplexing

CPE
Customer Premise Equipment

CWDM
Coarse Wavelength Division Multiplexing

IL
Insertion Loss

MPE
Maximum Permissible Exposure

NE
Network Element

OADM
Optical Add Drop Multiplexer

OCH
Optical Channel

OTN
Optical Transmission Network

SDH
Synchronous Digital Hierarchy

SMF
Single Mode Fiber

WDM
Wavelength Division Multiplexing

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6 GENERAL ON ALCATEL CUSTOMER DOCUMENTATION

6.1 Products, product-releases, versions and Customer Documentation

A **"product"** is defined by the network hierarchical level where it can be inserted and by the whole of performance and services for which it is meant.

A "product" evolves through successive **"product-releases"** which are the real products marketed for their delivery at a certain "product-release" availability date.

Therefore, a "product-release" defines a set of hardware components that, as a whole, identify the possible network applications and the equipment performance which the specific "product-release" has been designed, engineered and marketed for.

A "product-release" has its own standard Customer Documentation, composed by one or more handbooks.

A new "version" of a "product-release" may or may not produce a change in the status of the Customer Documentation set, as described in para.6.4.

6.2 Handbook supply to Customers

Handbooks are not automatically delivered together with the equipment they refer to.

The number of handbooks per type to be supplied must be decided at contract level.

6.3 Aims of standard Customer Documentation

Standard Customer Documentation, referred to hereafter, must be always be meant as plant-independent. Plant-dependent documentation, if envisaged by the contract, is subjected to commercial criteria as far as contents, formats and supply conditions are concerned (plant-dependent documentation is not described here).

Standard hardware documentation is meant to give the Customer personnel the possibility and the information necessary for installing, commissioning, operating and maintaining the equipment according to Alcatel Laboratory design choices.

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6.4 Handbook Updating

The handbooks associated to with the "product-release" are listed in para.1.3.

Each handbook is identified by:

- The name of the "product-release" (and "version" when the handbook is applicable to the versions starting from it, but not to the previous ones).
- The handbook name
- The handbook P/N
- The handbook edition (usually first edition=01)
- The handbook issue date. The date on the handbook does not refer to the date of print but to the date on which the handbook source file has been completed and released for the production.

6.4.1 Changes introduced in the same product-release (same handbook P/N)

The edition and date of issue might change on future handbook versions for the following reasons:

- Only the date changes (pointed out in the Table of Contents) when modifications are made to the editorial system resulting no change the technical contents of the handbook.
- The edition, hence the date, is changed because modifications made concern technical contents. In this case:
  - The chapters modified with respect to the previous edition are listed in Table 4.
  - In affected chapters, revision bars on the left of the page indicate modifications in text and drawings.

Changes concerning the technical contents of the handbook cause the edition number increase (e.g. from Ed.01 to Ed.02). Slight changes (e.g. for corrections) maintain the same edition but with the addition of a version character (e.g. from Ed.02 to Ed.02A). Version character can be used for draft or proposal editions.

Moreover, should the screen prints included in the handbook contain the product-release's "version" marking; they are not replaced in the handbooks related to a subsequent version, if the screen contents are unchanged.

6.4.1.1 Supplying updated handbooks to Customers

Supplying updated handbooks to Customers who have already received previous issues is submitted to commercial criteria.

By updated handbook delivery it is meant the supply of a complete copy of a complete copy of the new handbook (supplying errata-corrige sheets are not envisaged).

6.4.2 Changes due to a new product-release

A new product-release change the handbook P/N and the edition start from 01.

In this case the modified parts of the handbook are **not** listed.

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6.5 Customer documentation supply on CD-ROM

In the following "CD-ROM" means "Customer Documentation on CD-ROM".

6.5.1 Contents, creation and production of a CD-ROM

In most cases, a CD-ROM contains the documentation of one product-release (-version) in a certain language.

In some other cases, the same CD-ROM can contain the documentation of different product-release (-version) s in a certain language.

As a general rule:

- CD-ROMs for Network Management products do not contain:
  - The Installation Guides
  - The documentation of system optional features that customers could not buy from Alcatel together with the main applicative SW.

- CD-ROMs for Network Elements products do not contain:
  - The documentation of system optional features (e.g. System Installation Handbooks related to racks that customers could not buy from Alcatel together with the main equipment).
  - The Installation and Turn-up & Commissioning handbooks

A CD-ROM is obtained collecting various handbooks and processing them by Interleaf-World-View-Press after the manual addition of some hyperlinks, which make the navigation through the various handbooks easier. No additional information is added to each handbook; so that the documentation present in the CD-ROMs is exactly the same the customer would receive on paper.

The files processed in this way are then transferred on a PC where the viewer (Interleaf-World-View) is added and a master CD-ROM is recorded.

Suitable checks are made in order to have a virus-free product.

After a complete functional check, the CD-ROM image is electronically transferred to the archive of the Production Department, so that the CD-ROM can be produced and delivered to customers.

6.5.2 Use of the CD-ROM

The CD-ROM can be used both in PC and UNIX environments.

The minimum configuration for World View (rel.2.2.2) utilization on a PC is:

- Operative System: Windows 2000
- Processor: Pentium
- RAM: 128Mbyte
- Free disk space: 20Mbyte

The set-up procedure is present in the booklet included in the CD-ROM box.

After the set-up procedure, which installs the viewer in the PC or Unix WS environment, the customer is allowed to read the handbooks on the PC/WS screen, using the navigation and zooming tools included in the viewer, and to print selected parts of the documentation through a local printer.

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N.B. Copyright notification

WorldView:	Copyright 1981-1996 INTERLEAF Inc. All rights reserved. The use of WorldView is permitted only in association with the files contained in the CD-ROMs officially supplied by Alcatel.
Alcatel documents:	All rights reserved. Passing and copying of documents and files contained in the CD-ROMs officially supplied by Alcatel, use and communication of its contents are not permitted without written authorization from Alcatel.

6.5.3 CD-ROM identification

Each CD-ROM is identified:

a) By the following external identifiers, that are printed both on the booklet and the CD-ROM upper surface:
- The name of the "product-release(s)" (and "version" when the CD-ROM is applicable to, the versions starting from it, but not to the previous ones).
- A writing indicating the language(s)
- The CD-ROM P/N
- The CD-ROM edition (usually first edition=01)

b) And, internally, by the list of the source handbooks and documents (P/Ns and editions) by whose collection and processing the CD-ROM itself has been created.

6.5.4 CD-ROM updating

The list of source handbook/document P/Ns-editions indicated in section 6.5.3 point 2), in association with the CD-ROM's own P/N-edition, is also loaded in the Alcatel-Information-System as a structured list. Whenever a new edition of any of such handbooks/documents is released in the Alcatel archive system, the Alcatel-Information-System automatically raises a warning toward the Customer Documentation Department, indicating the list of CD-ROMs that must be updated to include the new editions of these handbooks/documents.

This causes the planning and creation of a new edition of the CD-ROM. Updating of CD-ROMs always follows, with a certain delay, the updating of the single handbooks composing the collection.

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DESCRIPTIONS

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1 FUNCTIONAL DESIGN

The 1692MSE product release 2.0 is passive CWDM equipment intended for the metro access, enterprise and metro core in the small cities. It is compliant with both ETSI and NEBS (level3) standards.

The 1692MSE release 2.0 has been designed to offer the following functions:

- Multiple configurations and multiple network architectures
  The 1692MSE R2.0 can be configured as a line terminal, a back-to-back terminal, a CPE, an Optical Add and Drop Multiplexer (OADM). These basic configurations cover both point-to-point and ring network applications.

- Multi-rate client signals
  The 1692MSE R2.0 is equipped with multi-rate transponders, which support client signals from 125 Mbit/s to 2.67 Gbit/s.

- Up to 8 optical channels in a single NE
  There are up to 8 optical channels in a single NE. Each channel is associated to a CWDM channel. The channels are 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570nm, 1590nm and 1610nm.

N.B. Normally, the central wavelengths of laser under normal temperature (25 degree C) are 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570nm, 1590nm and 1610nm.

Due to the specific technology of CWDM, no temperature control, the wavelength of system under the whole temperature range (0～70 degree C) should be 1471nm, 1491nm, 1511nm, 1531nm, 1551nm, 1571nm, 1591nm and 1611nm with ±7nm deviation.

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1.1 Basic Equipment configurations

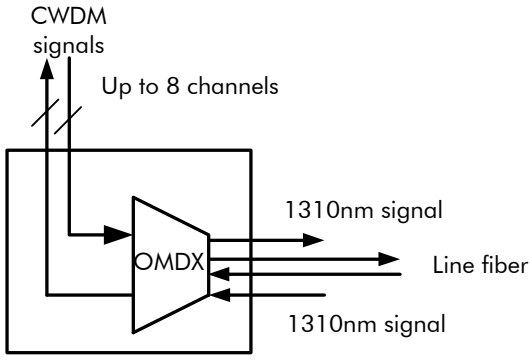
The 1692MSE R2.0, there are 3 kinds of basic configurations of the equipment:

- Line Terminal
- Optical Add and Drop Multiplexer (OADM)
- CPE

1.1.1 Line terminal

In line terminal configuration, the 1692MSE R2.0 collects/distributes up to 8channel CWDM signals to/from single optical fiber.

At the same time, 1310nm signals can be multiplexed/demultiplexed into/from the line fiber.



Unidirectional transmission

Figure6. 1692MSE R2.0 in line terminal configuration

1.1.2 Optical Add and Drop Multiplexer (OADM)

In OADM configuration, the 1692MSE R2.0 may add and drop 1310nm signal and a part of the traffic of an optical CWDM line, in both directions. In this configuration the equipment takes place as linear add and drop multiplexer in:

- Point-to-point links
- Ring networks

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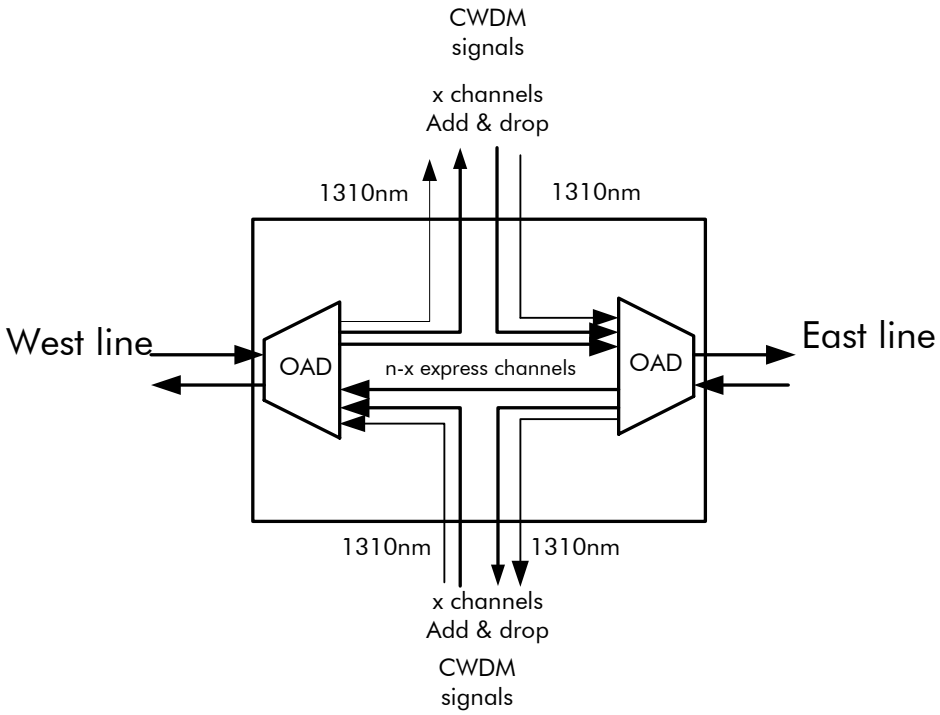

Unidirectional transmission with x (x=1, 2 or 4) channels add & drop

Figure7. 1692MSE R2.0 in OADM configuration

N.B. In this document, the definition about "East" and "West" is as follows:
East: From west to east;
West: From east to west;
"East" is in the right side of pages, while "west" in the left side.

1.1.3 CPE

For the CPE application, there are two configurations: 1-channel and 2-channel CPE, which is used to transmit 1 or 2 CWDM channels. The 1310nm signal can be multiplexed/demultiplexed in this configuration.

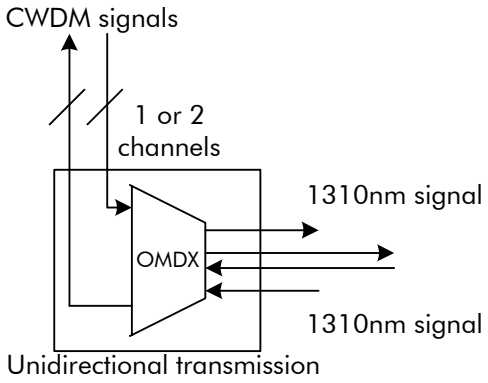

Figure8. Block diagram of CPE

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1.2 Network architectures

1692MSE R2.0 is a pure passive solution without wavelength adaptor; it must be used together with other equipments, which provide signals complying with ITU-T G.695, e.g., ALCATEL DSLAM equipment.

1692MSE R2.0 equipment can be used in Point-to-Point, Linear Add/Drop, Ring and CPE applications as shown in the follows.

1.2.1 Point-to-point links

A point-to-point link, based on 1692MSE, is obtained with:

A 1692MSE in line terminal configuration at each end of the link, eventually, one or more 1692MSE in OADM configuration.

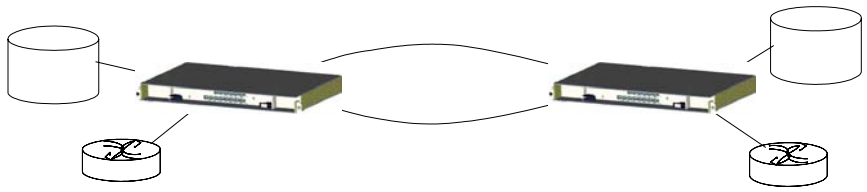

Figure9. 1692MSE in point-to-point application

1.2.2 Linear application

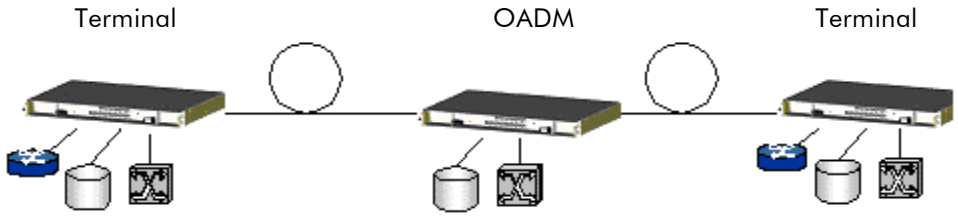

Figure10. 1692MSE in linear application

1.2.3 Ring application

A two fibers ring network is obtained with 1692MSE equipment in back-to-back terminal and OADM configurations.

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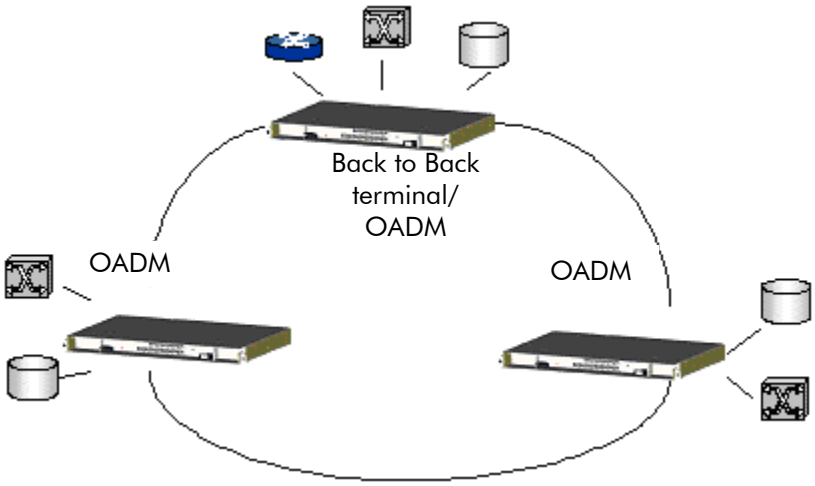

Figure11. 1692MSE in ring application

1.2.4 CPE application

For CPE, there are two configurations for 1692 R2.0: 1-channel and 2-channel CPE.

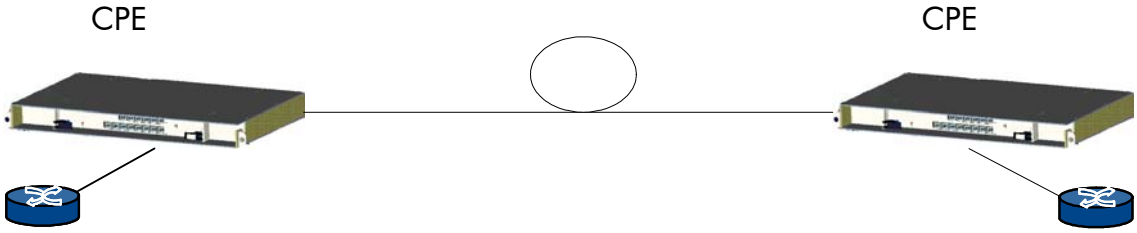

Figure12. 1692MSE in CPE application

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1.3 Description of the functions

This section describes the main functions of 1692MSE R2.0.

1.3.1 Main function in different configuration

1.3.1.1 Terminal configuration

For the Terminal, both the unidirectional and bidirectional applications are supported.

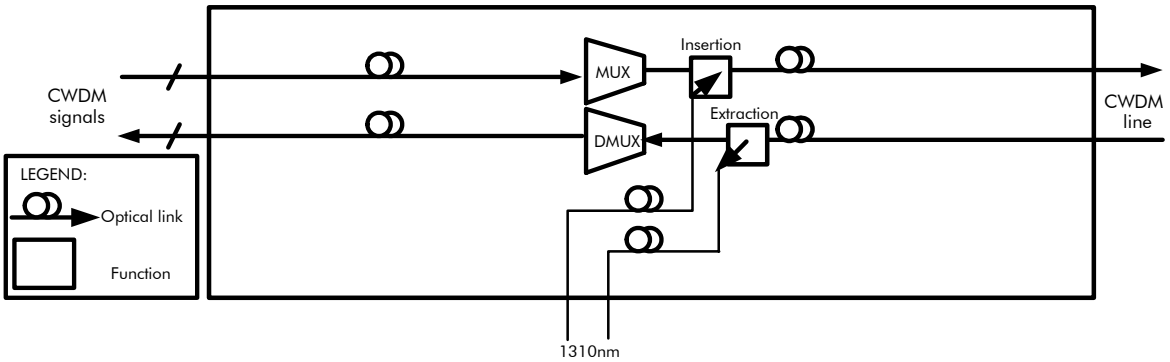

Figure13. Functional synopsis in unidirectional Line Terminal configuration

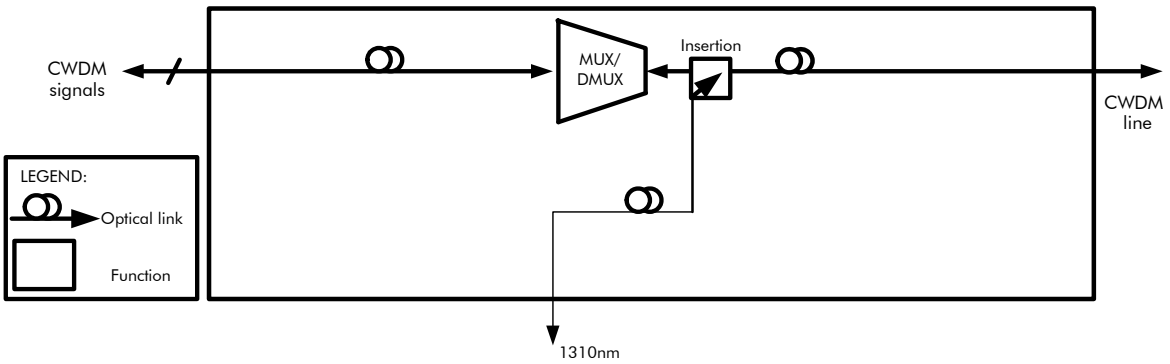

Figure14. Functional synopsis in bidirectional Line Terminal configuration

1.3.1.2 OADM configuration

For the OADM, it is the same situation as Terminal. The following configurations are supported:

- Unidirectional OADM with 1310nm channel
- Bidirectional OADM with 1310nm channel

There are up to 4 channels for add/drop per direction.

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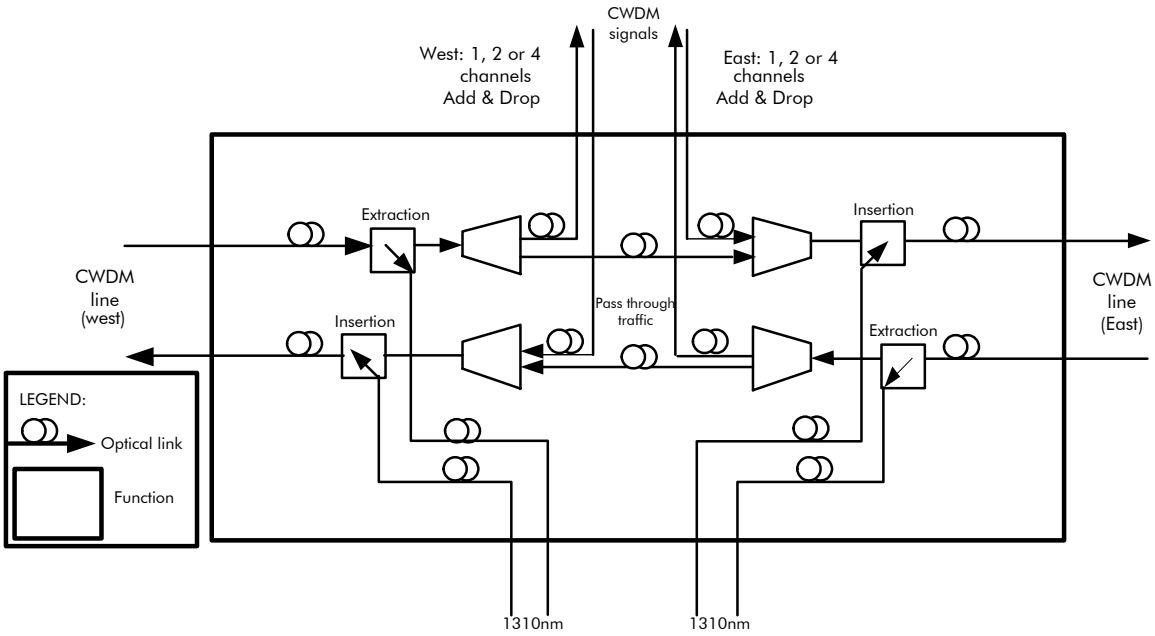

Figure15. Functional synopsis in unidirectional OADM configuration

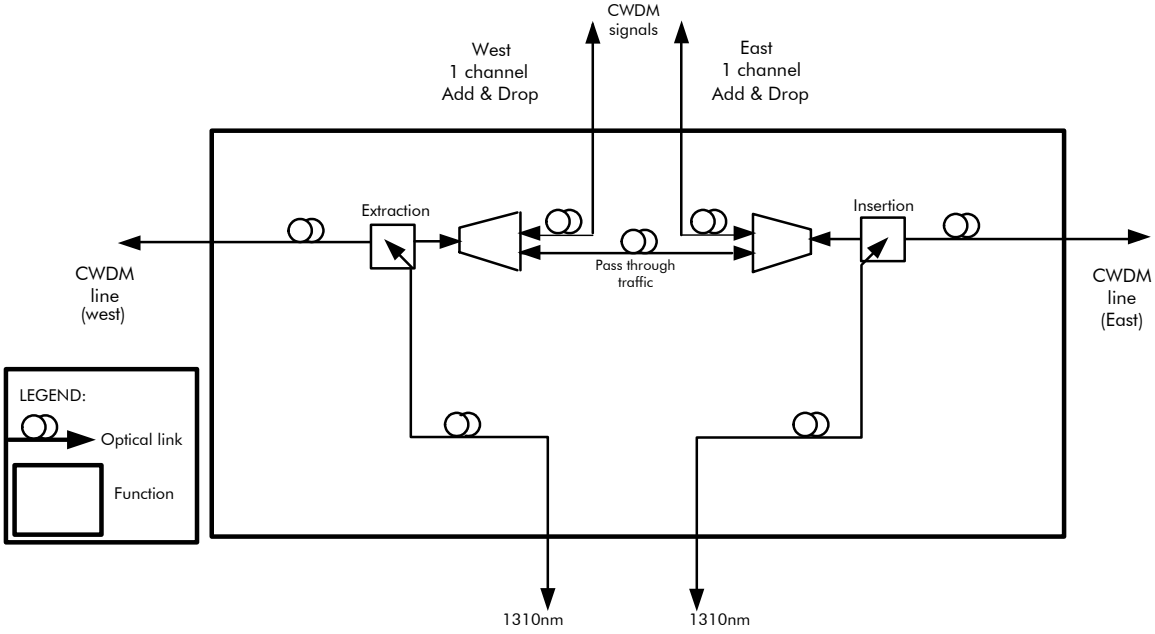

Figure16. Functional synopsis in bidirectional OADM configuration

1.3.1.3 CPE configuration

In the CPE configuration, there are two configurations: 1-channel and 2-channel CPE.

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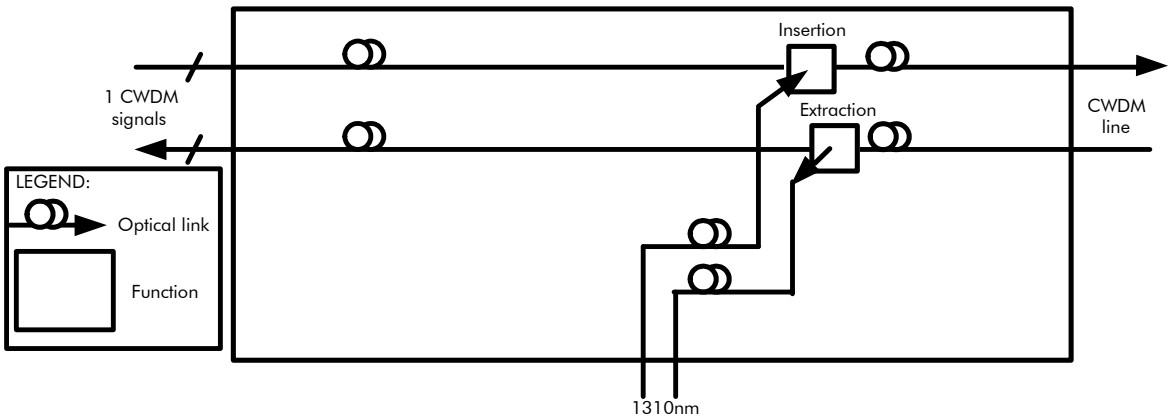

Figure17. 1-channel CPE configuration

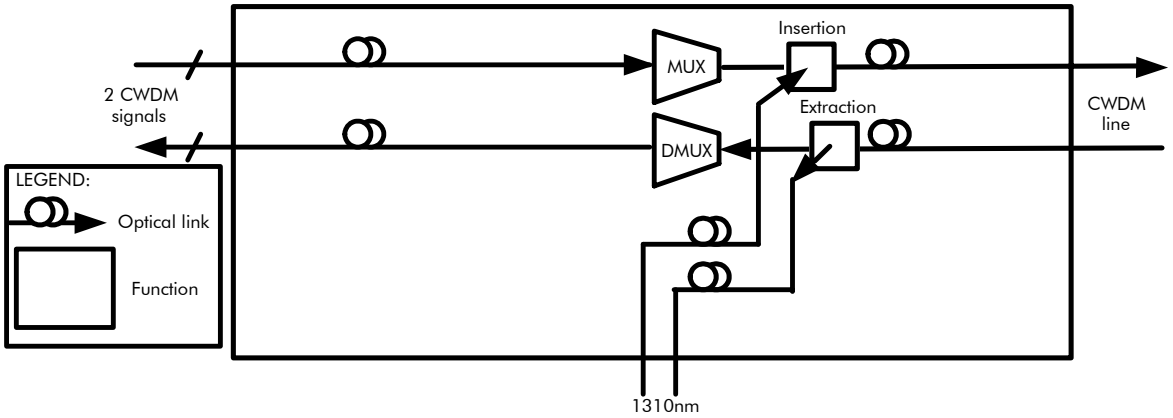

Figure18. 2-channel CPE configuration

1.3.2 Description of the functions

1.3.2.1 Wavelength division multiplexing/demultiplexing

The optical multiplexer receives the CWDM signals directly from client equipment, and multiplexes them into a fiber.

The optical demultiplexer receives the CWDM line signal, then demultiplexes it into several CWDM signals and sends them to the client equipment.

1.3.2.1.1 Optical multiplexing

The multiplexer function may be obtained with the following 8:1 optical MUX:

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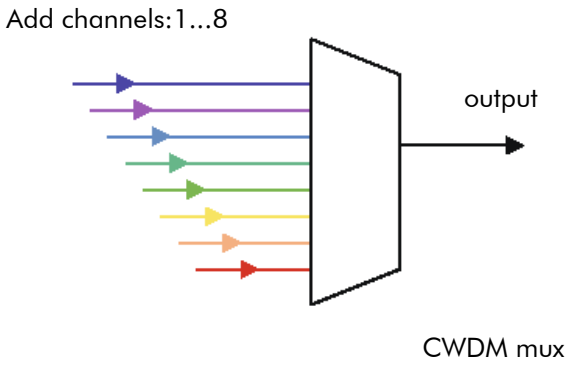

Figure19. CWDM MUX side

The multiplexer is able to multiplex 8 channels signals (in CWDM grid) issued from the transponder function into one multi-wavelength single fiber transmission. This device it's a 9 fibers passive optic component: 8 channels add inputs, 1 output (common). The multiplexer can be used in unidirectional line terminal configuration.

1.3.2.1.2 Optical demultiplexing

The demultiplexer function may be obtained with the following 1:8 optical DMUX:

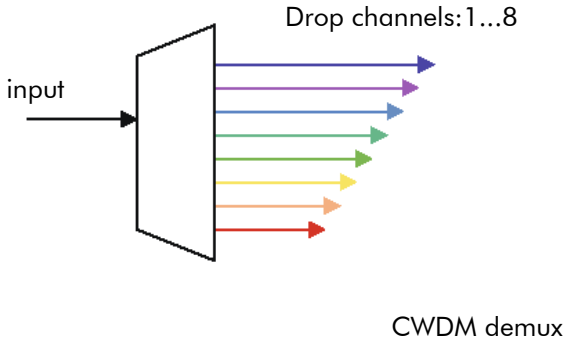

Figure20. CWDM DMUX side

The demultiplexer is able to demultiplex an input aggregate signal (n channels) into 8 channels signals (in CWDM grid) and send to the transponder.

1.3.2.2 Optical add drop multiplexing

In line OADM configuration, 1692MSE R2.0 supports unidirectional or bidirectional transmission. 1ch add/drop, 2ch add/drop or 4ch add/drop OADM module can be used in unidirectional transmission, while only a 2 ch add/drop OADM module can be used in a bidirectional transmission.

1.3.2.2.1 1ch add/drop

The 1ch add/drop OADM function may be obtained with the following scheme.

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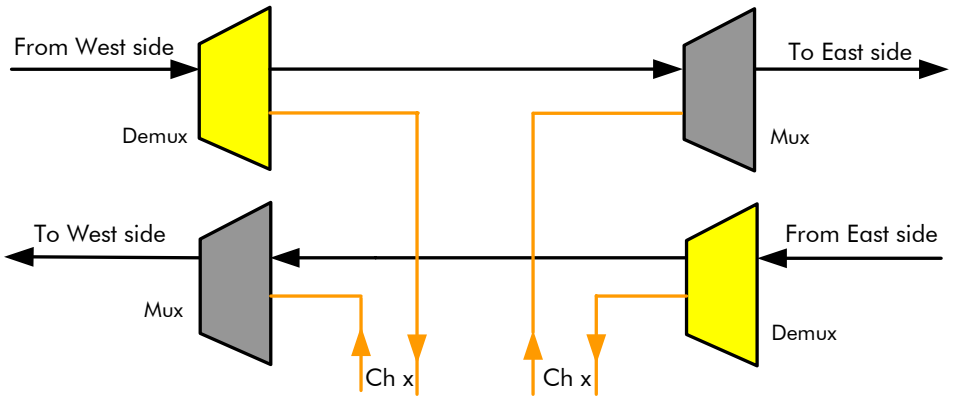

Figure21. 1 ch add and drop function in unidirectional transmission

This scheme has been chosen to implement the extraction and the insertion of chX from and into the WEST or EAST side of a CWDM protected network. In figure it's shown only the OADM working on the WEST side.

1.3.2.2.2 2ch add/drop

The 2ch add/drop OADM function may be obtained with the following scheme.

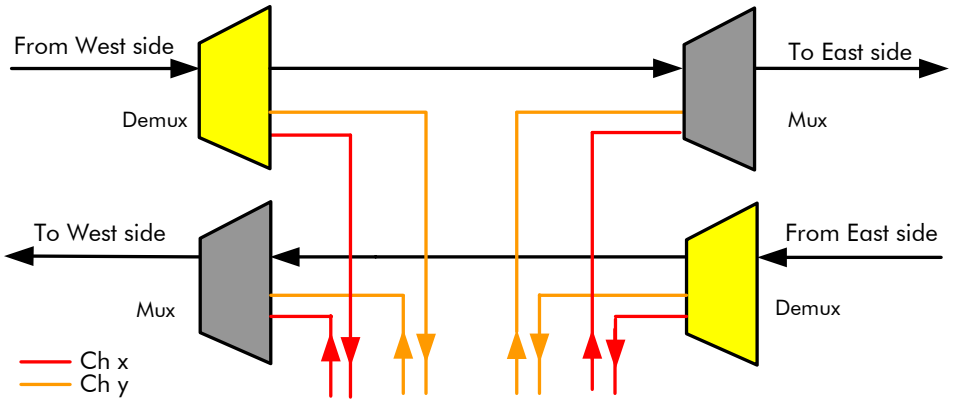

Figure22. 2 ch add and drop function in unidirectional transmission

This scheme has been chosen to implement the extraction and the insertion of chX, Y from and into the WEST or EAST side of a CWDM protected network. In figure it's shown only the OADM working on the WEST side.

1.3.2.2.3 4ch add/drop

The OADM is used to Add/drop four CWDM signals to/from a multi-wavelength signal on a single fiber transmission.

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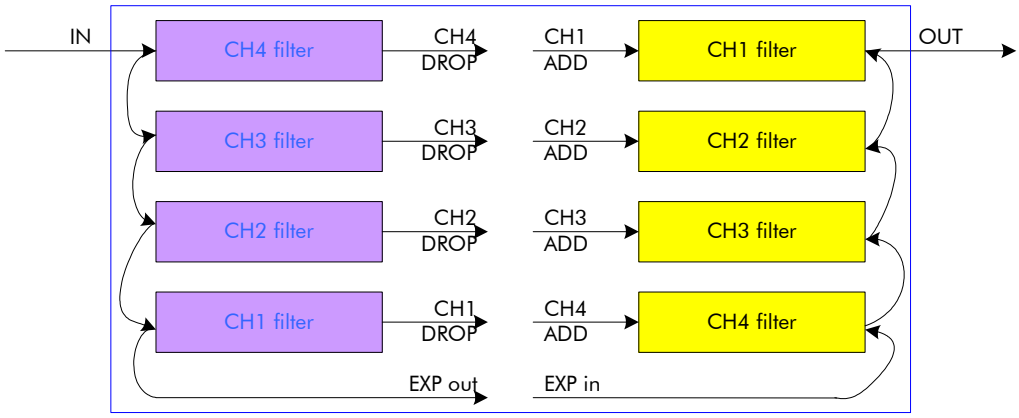

Figure23. 4 ch add/drop function

1.3.2.3 1310nm filter

In 1692MSE R2.0, 16ch upgradbility has been reserved through a CWDM band splitter, which is named 1310nm filter, it's different to the one used in 1692MSE previous releases.

It has not only 1310nm signal multiplexing/demultiplexing functionality, but also can pass through 1260~1450nm wavelength and reflect 1470~1610nm wavelength. This function can be used for upgrading current 8ch CWDM system to 16ch CWDM system in the future.

Figure24. 1310nm filter

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1.4 Device description

1.4.1 Shelf list

The shelf for 1692MSE R2.0 is a new designed item, which is 1rack unit high and has 2 slots.

1.4.2 Shelf and boards designation and reference

Table 6. Shelf and boards designation and reference

Name	Mnemonic	ALCATEL Code
1692MSE shelf	-	3AL 97732 AA**
18mm Dummy Front Panel	-	3AL 97733 AA**
Unidirectional MUX/DEMUX without 1310nm filter	C-MDX-U	3AL 97538 AB**
Unidirectional MUX/DEMUXE with 1310nm filter	C-MDX-E-U-S	3AL 97769 AA**
Bidirectional MUX/DEMUX without 1310nm filter	C-MDX-B	3AL 97538 AC**
Bidirectional MUX/DEMUX with 1310nm filter	C-MDX-B-S	3AL 97538 AD**
Unidirectional MUX/DEMUX2 without 1310nm filter	C-MDX2-U	3AL 97654 AA**
Unidirectional MUX/DEMUX2E with 1310nm filter	C-MDX2-E-U-S	3AL 97772 AA**
1-channel unidirectional MUX/DEMUX2E with 1310nm filter	C-MDX2-E-1-S	3AL 97772 BA**
2-channel unidirectional MUX/DEMUX2E with 1310nm filter	C-MDX2-E-2-4749-S	3AL 97772 CA**
	C-MDX2-E-2-5153-S	3AL 97772 CB**
	C-MDX2-E-2-5557-S	3AL 97772 CC**
	C-MDX2-E-2-5961-S	3AL 97772 CD**
1-channel unidirectional OADM without 1310nm filter	C-OAD-U-1-4747	3AL 97539 AB**
	C-OAD-U-1-4949	3AL 97539 AC**
	C-OAD-U-1-5151	3AL 97539 AD**
	C-OAD-U-1-5353	3AL 97539 AE**
	C-OAD-U-1-5555	3AL 97539 AF**
	C-OAD-U-1-5757	3AL 97539 AG**
	C-OAD-U-1-5959	3AL 97539 AH**
	C-OAD-U-1-6161	3AL 97539 AJ**
1-channel unidirectional OADME with 1310nm filter	C-OAD-E-U-1-4747-S	3AL 97770 AA**
	C-OAD-E-U-1-4949-S	3AL 97770 AB**
	C-OAD-E-U-1-5151-S	3AL 97770 AC**
	C-OAD-E-U-1-5353-S	3AL 97770 AD**
	C-OAD-E-U-1-5555-S	3AL 97770 AE**
	C-OAD-E-U-1-5757-S	3AL 97770 AF**
	C-OAD-E-U-1-5959-S	3AL 97770 AG**
	C-OAD-E-U-1-6161-S	3AL 97770 AH**
1-channel unidirectional OADM2 without 1310nm filter	C-OAD2-U-1-4747	3AL 97653 AA**
	C-OAD2-U-1-4949	3AL 97653 AB**
	C-OAD2-U-1-5151	3AL 97653 AC**
	C-OAD2-U-1-5353	3AL 97653 AD**

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	C-OAD2-U-1-5555	3AL 97653 AE**
	C-OAD2-U-1-5757	3AL 97653 AF**
	C-OAD2-U-1-5959	3AL 97653 AG**
	C-OAD2-U-1-6161	3AL 97653 AH**
1-channel unidirectional OADM2E with 1310nm filter	C-OAD2-E-U-1-4747-S	3AL 97771 AA**
	C-OAD2-E-U-1-4949-S	3AL 97771 AB**
	C-OAD2-E-U-1-5151-S	3AL 97771 AC**
	C-OAD2-E-U-1-5353-S	3AL 97771 AD**
	C-OAD2-E-U-1-5555-S	3AL 97771 AE**
	C-OAD2-E-U-1-5757-S	3AL 97771 AF**
	C-OAD2-E-U-1-5959-S	3AL 97771 AG**
	C-OAD2-E-U-1-6161-S	3AL 97771 AH**
2-channel unidirectional OADM without 1310nm filter	C-OAD-U-2-47474949	3AL 97539 PA**
	C-OAD-U-2-51515353	3AL 97539 QA**
	C-OAD-U-2-55555757	3AL 97539 RA**
	C-OAD-U-2-59596161	3AL 97539 SA**
2-channel unidirectional OADME with 1310nm filter	C-OAD-E-U-2-47474949-S	3AL 97770 BA**
	C-OAD-E-U-2-51515353-S	3AL 97770 BB**
	C-OAD-E-U-2-55555757-S	3AL 97770 BC**
	C-OAD-E-U-2-59596161-S	3AL 97770 BD**
2-channel unidirectional OADM2 without 1310nm filter	C-OAD2-U-2-47474949	3AL 97653 BE**
	C-OAD2-U-2-51515353	3AL 97653 BF**
	C-OAD2-U-2-55555757	3AL 97653 BG**
	C-OAD2-U-2-59596161	3AL 97653 BH**
2-channel unidirectional OADM2E with 1310nm filter	C-OAD2-E-U-2-47474949-S	3AL 97771 BA**
	C-OAD2-E-U-2-51515353-S	3AL 97771 BB**
	C-OAD2-E-U-2-55555757-S	3AL 97771 BC**
	C-OAD2-E-U-2-59596161-S	3AL 97771 BD**
4-channel unidirectional OADM2 without 1310nm filter	C-OAD2-U-4-47495153	3AL 97653 CA**
	C-OAD2-U-4-55575961	3AL 97653 CC**
4-channel unidirectional OADM2E with 1310nm filter	C-OAD2-E-U-4-47495153-S	3AL 97771 CA**
	C-OAD2-E-U-4-55575961-S	3AL 97771 CB**
OADM 4 ch harden temperature unidirectional with 1310nm filter	C-OAD-H-U-4-47495153-S	3AL 97653 KB**
	C-OAD-H-U-4-55575961-S	3AL 97653 KD**
1-channel bidirectional OADM without 1310nm filter	C-OAD-B-1-4755	3AL 97539 FA**
	C-OAD-B-1-4957	3AL 97539 GA**
	C-OAD-B-1-5159	3AL 97539 HA**
	C-OAD-B-1-5361	3AL 97539 JA**

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1-channel bidirectional OADM with 1310nm filter	C-OAD-B-1-4755-S	3AL 97539 BA**
	C-OAD-B-1-4957-S	3AL 97539 CA**
	C-OAD-B-1-5159-S	3AL 97539 DA**
	C-OAD-B-1-5361-S	3AL 97539 EA**

N.B. The boards named with "-E" can be used under harden temperature, such as C-MDX-E-U-S.

1.4.3 Slot allocations

The slot allocations are shown as follows:

Table 7. Slot allocations and configuration of 1U Shelf

Unit	Allowed Unit Types In Slot	
	1	2
C-MDX-U	x	
C-MDX-E-U-S	x	
C-MDX-B	x	
C-MDX-B-S	x	
C-MDX2-U	x	
C-MDX2-E-U-S	x	
C-MDX2-E-1-S	x	
C-MDX2-E-2-XX-S	x	
C-OAD-U-1-XX	x	
C-OAD-E-U-1-XX-S	x	
C-OAD2-U-1-XX	x	
C-OAD2-E-U-1-XX-S	x	
C-OAD-U-2-XXXX	x	
C-OAD-E-U-2-XXXX-S	x	
C-OAD2-U-2-XXXX	x	
C-OAD2-E-U-2-XXXX-S	x	
C-OAD-B-1-XX	x	
C-OAD-B-1-XX-S	x	
C-OAD2-U-4-XXXXXXXX	x	
C-OAD2-E-U-4-XXXXXXXX-S	x	
C-OAD-H-U-4-XXXXXXXX-S	x	
18mm Dummy Front Panel		x

N.B. "x" means the unit type can be plugged in the slot.

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1.5 System Configuration

1.5.1 Configuration criteria

The basic configuration of the 1692 MSE relies on the following criteria:

- The network architecture and the position of the equipment in the network define the NE type (line terminal, OADM or CPE).
- Optical power budget limitations of CWDM channels and 1310nm channel (depending on the client equipments interfacing with 1692MSE R2.0).
- Need for upgradeability
- The initial cost

1.5.2 Terminal configuration

C-MDX-U/C-MDX-E-U-S, C-MDX2-U/C-MDX2-E-U-S and C-MDX-B (-S) can be used in 1692R2.0 terminal configuration, including unidirectional and bidirectional application. The figure below shows the configuration.

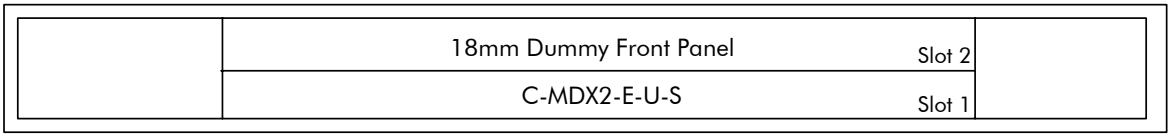

Figure25. An example for slot allocations in unidirectional Terminal application

1.5.3 OADM configuration

1.5.3.1 1-channel OADM

Any wavelength among the 8 CWDM wavelengths can be added and dropped. So, there are eight types of 1-channel OADM boards according to the different wavelength. C-OAD-U-1-XX /C-OAD-E-U-1-XX-S and C-OAD2-U-1-XX/C-OAD2-E-U-1-XX-S can be used in this configuration.

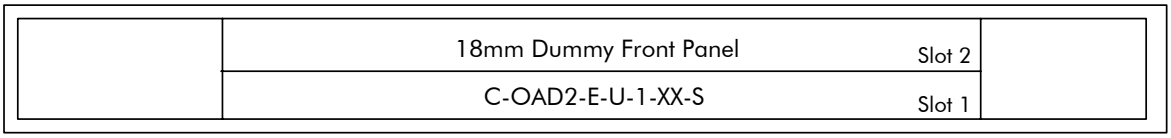

Figure26. An example for slot allocations in unidirectional OADM application (1 channel add/drop)

1.5.3.2 2-channel OADM

In this case, only 2 channels per direction can be added and dropped. According to different wavelength combinations, there are four kinds of 2-channel OADM boards. C-OAD-U-2-XXXX /C-OAD-E-U-2-XXXX-S and C-OAD2-U-2-XXXX/C-OAD2-E-U-2-XXXX-S can be used in this configuration.

Table 8. Wavelength combination for 2-channel unidirectional application

Number	**1**	**2**	**3**	**4**
Channels (nm)	1470,1490	1510,1530	1550,1570	1590,1610

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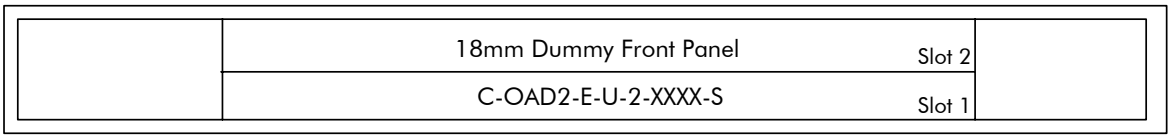

Figure27. An example for slot allocations in unidirectional OADM application (2 channels add/drop)

1.5.3.3 4-channel OADM

In this case, only 4 channels per direction can be added and dropped. According to different wavelength combinations, there are two kinds of OADM boards. C-OAD2-U-4-XXXXXXXX /C-OAD2-E-U-4-XXXXXXXX-S and C-OAD-H-U-4-XXXXXXXX-S can be used in this configuration.

Table 9. Wavelength combination for 4-channel unidirectional application

Number	**1**	**2**
Channels (nm)	1470,1490,1510,1530	1550,1570,1590,1610

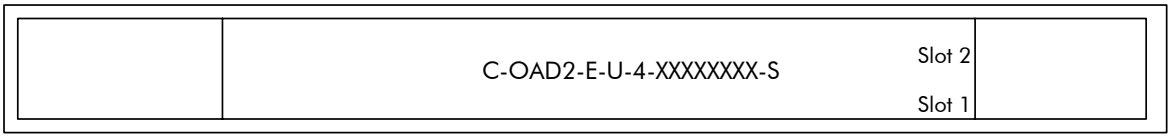

Figure28. An example for slot allocations in unidirectional OADM application (4 channels add/drop)

1.5.3.4 Bidirectional OADM

In this case, only 1 channel per direction can be added and dropped. Depending on different wavelength combinations, there are four kinds of OADM boards.

Table 10.Wavelength combination for a bidirectional application

Number	1	2	3	4
Channels (nm)	1470,1550	1490,1570	1510,1590	1530,1610

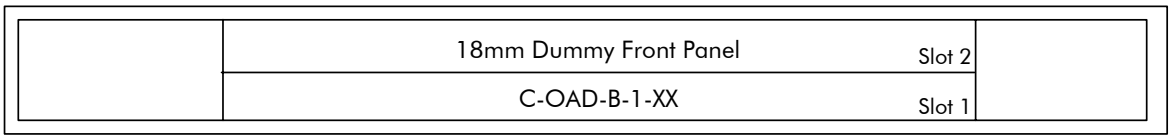

Figure29. An example for slot allocations in bidirectional OADM application

1.5.4 CPE configuration

There are two types of CPE configurations: 1-channel and 2-channel CPE. C-MDX2-E-1-S and C-MDX2-E-2-XX-S can be used in this configuration.

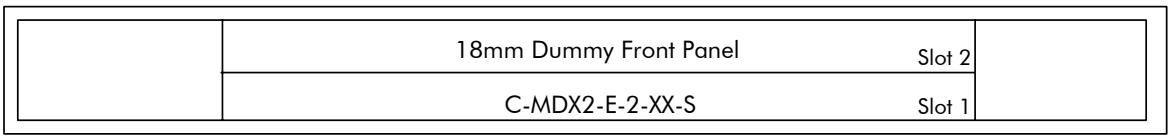

Figure30. An example for slot allocations in 2-channel CPE application

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1.6 Optical safety

1.6.1 General information

1.6.1.1 Hazard level

The laser level of 1692 R2.0 is Class 1.Hazard level 1, according to IEC 60825-1 (1998), and IEC 60825-2 (2000) requirements, can be assigned to all ports of the system.

Class 1: Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Class 1 laser product: Any laser product that does not permit human access to laser radiation in excess of the accessible emission limits of Class 1 for applicable wavelength and emission durations.

N.B. The Class 1 laser products should be used for demonstration, display or entertainment in unsupervised areas. The use of other classes of lasers for such purposes should be permitted only when the laser operation is under the control of an experienced, well-trained operator and/or when spectators are prevent from exposure to levels exceeding the applicable MPE.

N.B. Lasers of Class 1 should be used for surveying, alignment and leveling applications whenever practicable. There may be situations, however, where high ambient light levels require the use of lasers of higher output power.

1.6.1.2 Location type

The equipment shall be installed in "restricted location" (industrial and commercial premises) or controlled locations (optical cable ducts and switching centers).

1.6.1.3 Labeling

The labels reported below are put during factory settings. The labels are affixed on all front covers that protect optical connectors, located on the front side plate of all the units involved in optical transmission:

HAZARD symbol:

Example of EXPLANATORY label:

1.6.2 1692MSE R2.0 specific requirement

In order to meet the requirement of safety, the CWDM signals input in the 1692 R2.0 should not be higher than +5dBm. In doing so, it can avoid optical power becoming too high after the CWDM signals being multiplexed.

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1.7 Environmental characteristics

The 1692MSE is designed to be compliant with both ETSI and NEBS (level 3) standards.

1.7.1 ETSI compliancy

The electromagnetic compatibility requirements for the system are specified in the ETS 300 386.
The following features are applicable:

- Environmental class 1
- Normal priority of service

1.7.1.1 Immunity

The following table specifies the valid tests and their compliance criteria for immunity. All the items make reference to the chapters of the pr ETS 300 386.

Table 11.Valid tests and compliance criteria for immunity

Phenomenon	Coupling (Port)	Test Method	Test Level	Compliance Criterion
Electrostatic Discharge	-	-	4 kV (contact) / 4 kV (air) 6 kV (contact) / 8 kV (air)	NP LFS
Electrical Fast Transients	Not Applicable			
Radiated Electromagnetic Field	-	-	3 V/m 10 V/m	NP LFS
Continuous Conducted Signals	Not Applicable			

NP: Normal performance within specified limits
LFS: Loss of function (self recovery)
- No corruption of data management
- Temporary loss of function following application of test
- Self recovery to normal performance occurs at the cessation of the test

1.7.1.2 Emission

As the 1692MSE R2.0 equipment has just pure passive board, such as CWDM MUX/DEMUX without any management. It will not be powered on. So there is no emission.

1.7.1.3 Storage & transportation

The technical data of this chapter are, where it is possible, referred to ITU-T Recommendations or ETSI Standards.

The system is designed for outdoor operation without controlled air temperature. The complete environmental conditions, including climatic, atmospheric and mechanical conditions are specified in the ETS 300 019. The following environmental hazard levels of this standard apply.

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Storage

The equipment meets the following requirements Vs. Storage:

ETSI EN 300 019-2-1: 2000, hazard level 1.2

Hazard level 1.2: Weatherproofed, not temperature controlled storage location.
This hazard level applies to weatherproofed storage having neither temperature nor humidity control. The location may have openings directly to the open air, i.e., it may be only partly weatherproofed.

This hazard level applies to storage locations:

- Where equipment may be exposed to solar radiation and temporarily to heat radiation: They may also be exposed to movements of the surrounding air due to draughts, e.g. through doors, windows or other openings. They may be subjected to condensed water, dripping water and to icing. They may also be subjected to limited wind driven precipitation including snow.
- Where mould growth or attacks by animals, except termites, may occur.
- With normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area, and/or with heavy traffic.
- In areas with sources of sand or dust, including urban areas
- With vibration of low significance and insignificant shock

The conditions of this hazard level may occur in:

- Unattended buildings
- Some entrances of buildings
- Some garages and shacks

Table 12.Main climatic conditions

Main Climatic Conditions	Unit	Value
Low air temperature	℃	-25
High air temperature	℃	55
Low relative humidity	%	10
High relative humidity	%	100
Low absolute humidity	G/m^3	0.5
High absolute humidity	G/m^3	29
Rain intensity	mm/min	No
Rate of change of temperature	℃/min	0.5
Low air pressure	kPa	70
High air pressure	kPa	106
Solar radiation	W/m^2	1120
Movement of the surrounding air	m/s	30
Condition of condensation	-	Yes
Condition of precipitation	-	Yes, wind-driven precipitation
Condition of icing and frosting	-	Yes

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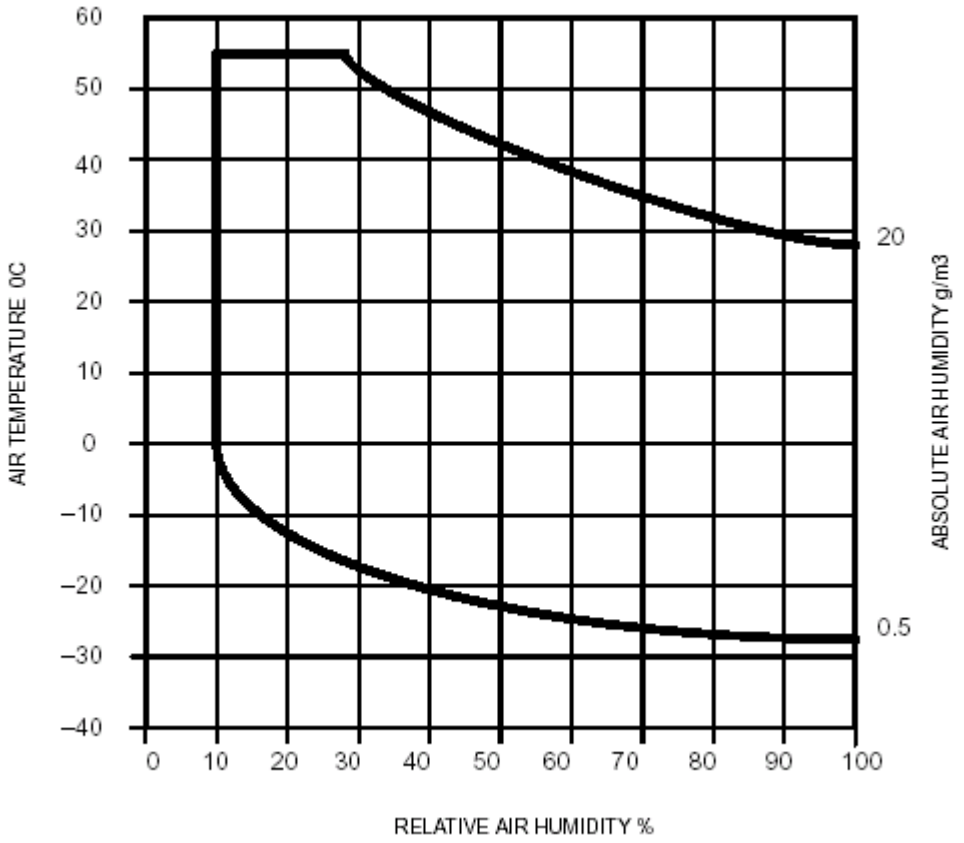

Figure31. Climatogram for hazard level 1.2: no temperature controlled storage location

Transportation

The equipment meets the following requirements vs. transportation:

ETSI EN 300 019-2-2: 1999, hazard level 2.2

Hazard level 2.2: Careful transportation.
This hazard level applies to transportation where special care has been taken e.g. with respect to low temperature and handling.

Hazard level 2.2 covers the condition of hazard level 2.1. In addition hazard level 2.2 includes transportation in all types of lorries and trailers in areas with well-developed road system.

It also includes transportation by ship and by train specially designed, shock-reducing buffers. Manual loading and unloading of to 20 Kg is included.

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Table 13.Main climatic conditions

Environmental Parameter	Unit	Value
Low air temperature	℃	-25
High air temperature, air in unventilated enclosures	℃	70
High air temperature, air in ventilated enclosures or outdoor air	℃	40
Relative humidity	%	95
Absolute humidity	g/m^3	60
Low air pressure	kPa	70
Movement of the surrounding air	m/s	20
Rain intensity	mm/min	6
Solar radiation	W/m^2	1120
Heat radiation	W/m^2	600
Condition of condensation	-	Yes

1.7.1.4 Operating conditions

The Equipment meets the requirements of ETSI Stand. The functionality of the Equipment, Vs. Temperature, is in compliance with:

ETSI EN 300 019-2-3: 1999, hazard level 3.3

Hazard level 3.3: Not temperature-controlled locations

This hazard level applies to locations:

Where installed equipment may be exposed to solar radiation and heat radiation. They may also be exposed to movements of the surrounding air due to draughts in buildings, e.g. through open windows. They may be subjected to condensed water and to water from sources other than rain and icing. They are not subjected to precipitation.

- Where mould growth or attacks by animals, except termites, may occur.
- With normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area and/or with heavy traffic.
- In close proximity to sources of sand or dust.

With vibration of low significance, e.g. for products fastened to light supporting structures subjected to negligible vibrations.

The conditions of this hazard level may be found in:

- Entrances and staircases of buildings
- Garages
- Cellars
- Certain workshops
- Buildings in factories and industrial process plants
- Unattended equipment stations
- Certain telecommunication buildings
- Ordinary storage rooms for frost resistant products and farm buildings…

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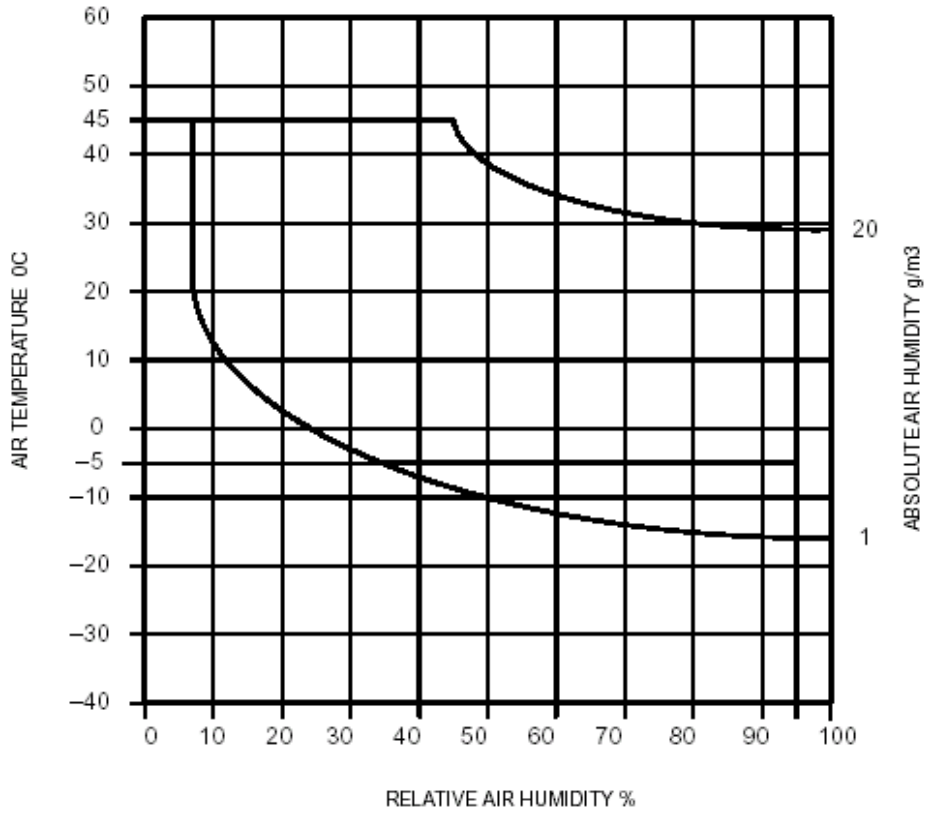

Figure32. Climatogram for hazard level 3.2: partly temperature controlled locations

Table 14.Main climatic conditions

Environmental Parameter	**Unit**	**Value**
Low air temperature	℃	-25
High air temperature	℃	55
Low relative humidity	%	10
High relative humidity	%	100
Low absolute humidity	G/m^3	0.5
High absolute humidity	G/m^3	29
Rate of change of temperature	℃/min	0.5
Low air pressure	kPa	70
High air pressure	kPa	106
Solar radiation	W/m^2	700
Heat radiation	W/m^2	600
Movement of the surrounding air	m/s	5
Condition of condensation	-	Yes
Condition of wind-driven rain, snow	-	No
Condition of icing	-	Yes
Solar radiation	W/m^2	1200
Heat radiation	W/m^2	600

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1.7.2 NEBS compliancy

1692MSE R2.0 equipments meet NEBS level3 requirements.

The NEBS Level3 criteria provide the highest assurance of product operability. Level 3 criteria are suited for equipment applications, which demand minimal service interruptions over the equipment's life.

1.7.2.1 Immunity

It is a conditional requirement (see Section 3.1.2 for the condition) that the EUT perform properly when subjected to the calibration electric fields of 138.6 dBmV/m (8.5 V/m), RMS value of the unmodulated test signal over the frequency range of 0.01 through 10,000 MHz. During the test, the test signal shall be modulated. In general, performance criteria are given in the applicable Bellcore technical reference; examples of particular performance criteria are found in Section 3.5.3. This test is to be performed with all the EUT cabinet doors closed.

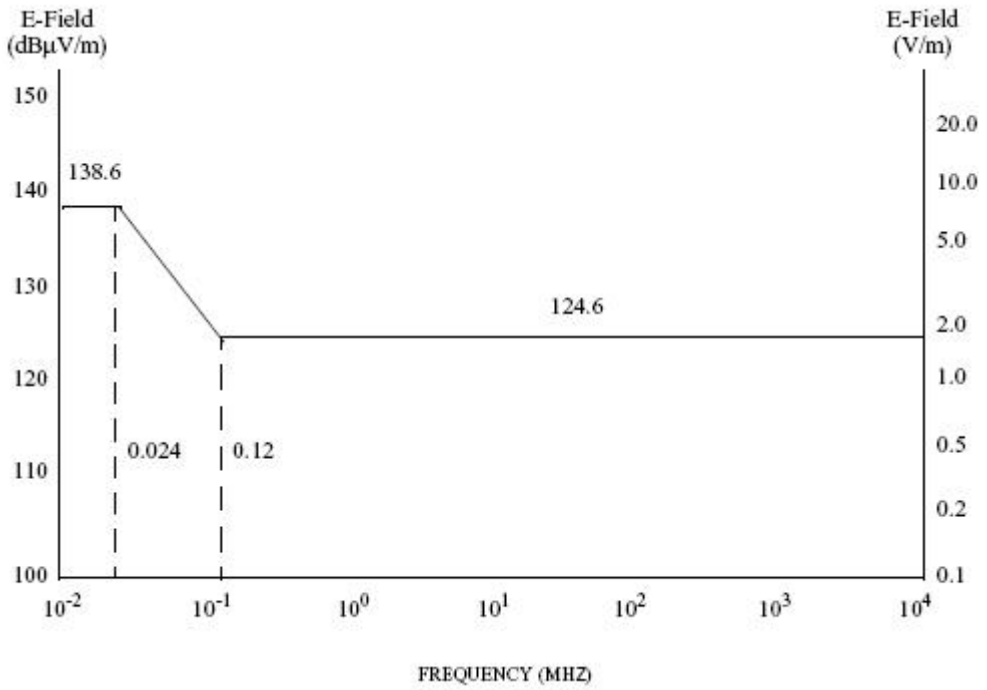

Figure33. Radiated (electric field) immunity Requirement (Field Calibration)

The EUT shall perform properly when it is subjected to calibration electric field of 138.6 dBmV/m (8.5 V/m), RMS value of the unmodulated test signal over the frequency range of 0.01 through 10,000 MHz. During the test, the test signal shall be modulated. In general, performance criteria are found in the applicable Bellcore technical reference; examples of particular performance criteria are found in Section 3.5.3. This test shall be done with all the EUT cabinet doors open, except for doors that are not intended to be opened during EUT operation, maintenance, and/or repair, which may remain closed.

1.7.2.2 Emission

As the 1692MSE R2.0 equipment has just pure passive board, such as CWDM MUX/DEMUX without any management. It will not be powered on. So there is no emission.

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1.7.2.3 Storage & transportation

Storage

Low-Temperature Exposure and Thermal Shock
The packaged equipment shall not sustain any damage or deteriorate in functional performance after it has been exposed to the environment described in the following table.

Table 15.Low-temperature exposure and thermal shock

Temperature*	Event	Duration/Rate of Change
-40°C to 23°C *(-40°F to 73°F)*	Temperature transition	30°C/hr *(54°F/hr)*
-40°C *(-40°F)*	Temperature soak	72 hr (minimum)
-40°C to 23°C *(-40°F to 73°F)*	Temperature transition	Less than 5 minutes

* Any humidity (or uncontrolled humidity).

High-Temperature Exposure and Thermal Shock
The packaged equipment shall not sustain any damage or deteriorate in functional performance after it has been exposed to the environment described in the following table.

Table 16.High-temperature exposure and thermal shock

Temperature*	Event	Duration/Rate of Change
23°C to 70°C *(73°F to 158°F)*	Temperature transition	30°C/hr *(54°F/hr)*
70°C *(158°F)*	Temperature soak	72 hr (minimum)
70°C to 23°C *(158°F to 73°F)*	Temperature transition	Less than 5 minutes

* Any humidity (or uncontrolled humidity).

High Relative Humidity Exposure
The packaged equipment shall not sustain any damage or deteriorate in functional performance after it has been exposed to the environment described in the following table.

Table 17.High-temperature exposure and thermal shock

Temperature*	Event	Duration/Rate of Change
23°C to 40°C, any RH *(73°F to 104°F)*	Temperature transition	30°C/hr *(54°F/hr)*
40°C *(104°F)*	Transition to 90% to 95% RH	< 4 hr
40°C *(104°F)*, 90% to 95% RH	Temperature/humidity soak	96 hr
40°C to 23°C, any RH *(104°F to 73°F)*	Temperature transition	30°C/hr *(54°F/hr)*

Transportation

Category A Containers
The packaged equipment **shall not** sustain any physical damage or deteriorate in functional performance when subjected to free-fall shock levels of the following table.

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Table 18.Category A container packaged equipment Shock criteria

Mass (kg)	Drop Height (mm)	Handling Mode
0 to < 10 *(0 - 22 lb)*	750 *(29.5 in)*	One person throwing
10 to < 25 *(22 - 55.1 lb)*	600 *(23.6 in)*	One person carrying
25 to < 50 *(55.1 - 110.2 lb)*	525 *(20.7 in)*	Two person carrying
50 to < 100 *(110.2 - 220.5 lb)*	450 *(18.5 in)*	Two person carrying

Category B Containers
The packaged equipment **shall not** sustain any physical damage or deteriorate in functional performance when subjected to shock levels of the following table.

Table 19.Category B container packaged equipment shock criteria

Mass (kg)	Drop Height (mm)
< 450 *(992 lb)*	300 *(11.8 in)*
450 or greater *(992 lb)*	150 *(5.9 in)*

Unpackaged Equipment Shock Criteria
The unpackaged equipment **shall not** sustain any physical damage or deteriorate in functional performance when subjected to applicable shock levels of the following table.

Minor cosmetic damage, such as scratches, dings, and nicks, do not necessarily constitute nonconformance.

Table 20.Unpackaged equipment shock criteria

Mass (kg)	Drop Height (mm)
0 to < 10 *(0 - 22 lb)*	100 *(3.9 in)*
10 to < 25 *(22 - 55.1 lb)*	75 *(3 in)*
25 to < 50 *(55.1 - 110.2 lb)*	50 *(2 in)*
50 or greater *(110.2 lb)*	25 *(1 in)*

1.7.2.4 Operating conditions

Operating Temperature and Humidity Criteria

The following table & figure provide the normal operating temperature/humidity levels and short-term operating temperature/humidity levels in which network equipment shall operate. The test levels in this document are based on the short-term levels.

The equipment shall not sustain any damage or deterioration of functional performance during its operating life when operated within the conditions of follow table.

Table 21.Ambient temperature and humidity limits

Conditions	Limits
Temperature • Operating • Short-term	 5°C to 40°C *(41°F to 104°F)* -5°C to 50°C *(23°F to 122°F)*
Rate of temperature change	30°C/hr *(54°F/hr)*
Relative Humidity • Operating • Short-term	 5% to 85% 5% to 90% but not to exceed 0.024 kg water/kg of dry air

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N.B.

a) Ambient refers to conditions at a location 1.5 m *(59 in)* above the floor and 400 mm *(15.8 in)* in front of the equipment.

b) Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.)

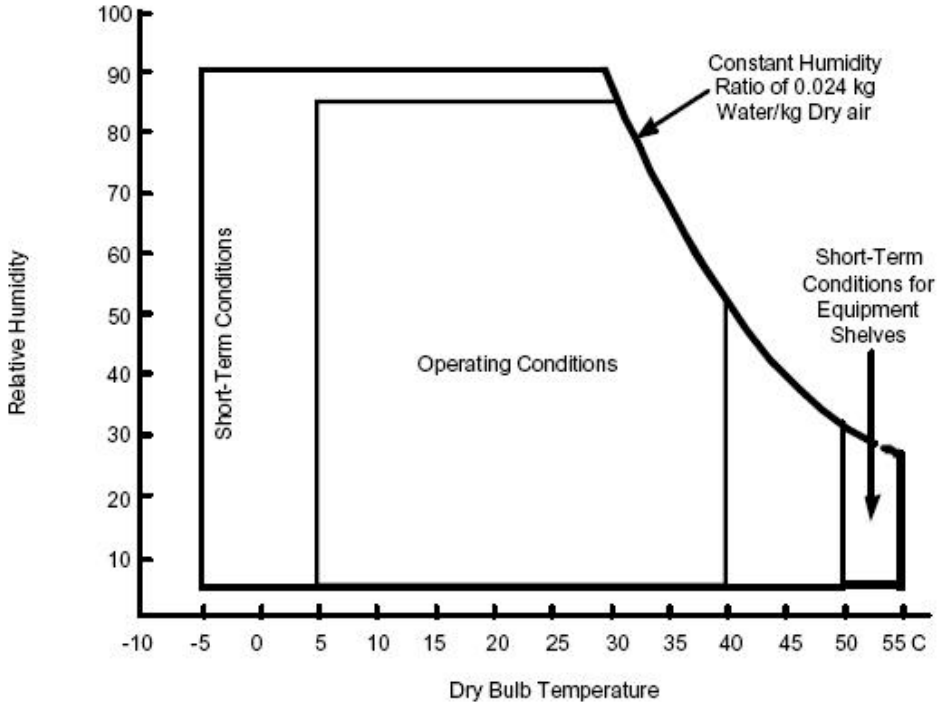

Figure34. Ambient temperature and humidity limits

Contamination Levels

It is an objective that equipment operate reliably within the gaseous contamination levels expressed in the following table.

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Table 22.Outdoor contaminant levels

Contaminant	Concentration **
Airborne Particles (TSP - Dichot 15)*	90 mg/m^3
Coarse Particles	50 mg/m^3
Fine Particles	50 mg/m^3
Water Soluble Salts	30 mg/m^3
Sulfate	30 mg/m^3
Nitrites	12 mg/m^3
Volatile Organic Compounds (boiling point > 30°C)	400 ppb 1600 mg/m^3
Sulfur Dioxide	150 ppb
Hydrogen Sulfide	40 ppb
Ammonia	50 ppb
Oxides of Nitrogen	
NO	500 ppb
NO2	250 ppb
HNO3	50 ppb
Ozone	250 ppb
Gaseous Chlorine (HCl +Cl2)	6 ppb

* TSP - Dichot 15 = total suspended particulates determined using a dichotomous sampler with a 15-mm inlet
** mg/m^3 = micrograms per cubic meter ppb = parts per billion

Outside Plant Equipment
It is a requirement that equipment intended to function in outdoor air, such as cabinets installed on pads or poles, with little or no filtration should operate reliably for the intended service life at the contaminant levels listed in Table 22.

The values listed in this table are based on Bellcore field measurements, EPA reports, and reviews of published air quality studies. The technical data of this chapter are, where it is possible, referred to GR63 & GR1089.

N.B. GR - 63 - CORE
Network Equipment-Building System (NEBS) Requirements: Physical Protection issue 1, October 1995.

N.B. GR - 1089 - CORE
Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunication equipment issue 2, December 1997.

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2 MECHANICAL DESCRIPTION

In 1692MSE release 2.0, only the 1RU shelf can be used in a NE. A fully loaded 1692MSE system can be housed in a single standard ETSI or ANSI rack.

2.1 Shelf

Only the 1RU shelf can be managed in a 1692MSE NE.

2.1.1 Empty shelf

2.1.1.1 Shelf organization

The 1RU shelf is divided into 2 unit slots:

- Slot1
- Slot2

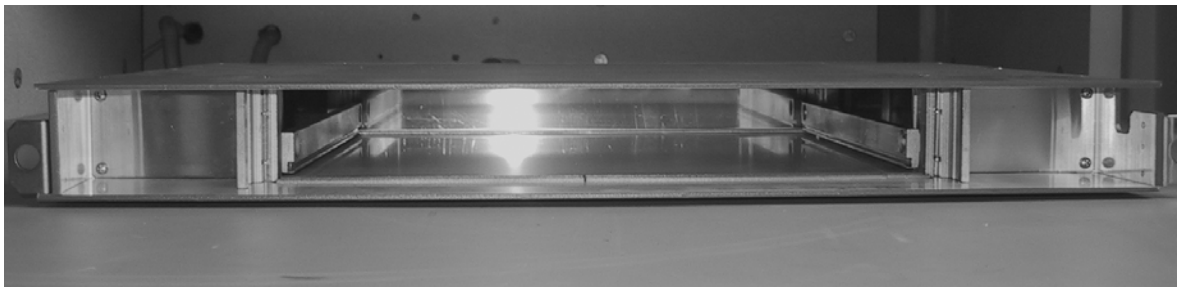

Figure35. Shelf organization

2.1.1.2 Shelf dimensions

The size of 1692MSE Compact shelf is:

- Width: 446.2mm
- Depth: 274mm (with cover)
- Height: 44mm

Depth is compliant with the 300 mm deep ETSI rack (no limitation in ANSI rack)

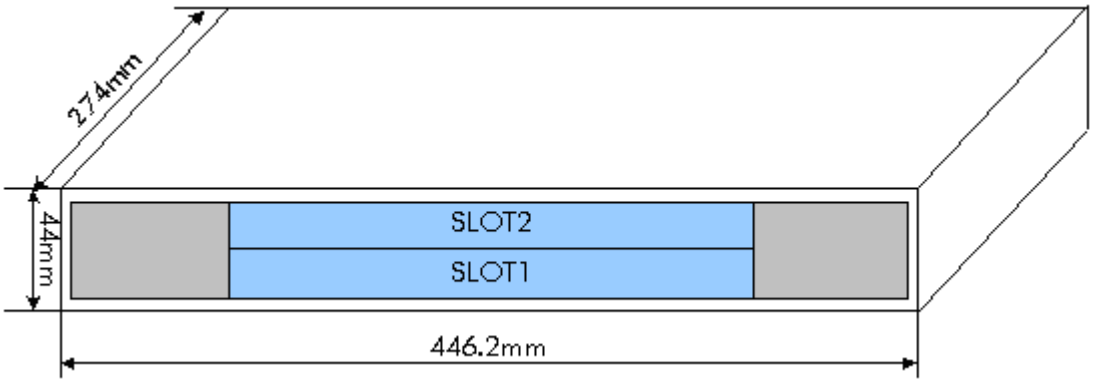

Figure36. Shelf dimensions

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2.1.2 Shelf front view with cover

Figure37. Shelf front view with cover

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2.2 Boards description

2.2.1 C-MDX2-E-U-S board (example)

Figure38. C-MDX2-E-U-S board front view

2.2.2 C-MDX2-E-2-5153-S board (example)

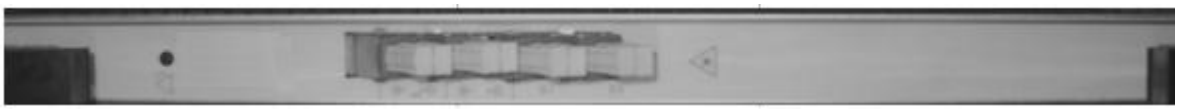

Figure39. C-MDX2-E-2-5153-S board front view

2.2.3 C- OAD2-E-U-1-4747-S board (example)

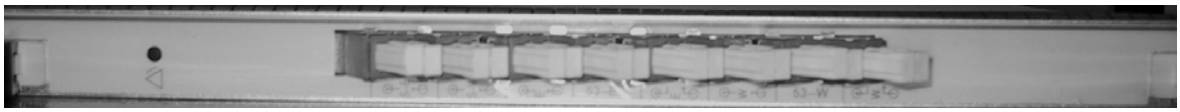

Figure40. C-OAD2-E-U-1-4747-S board front view

2.2.4 C-OAD2-E-U-2-4749-S board (example)

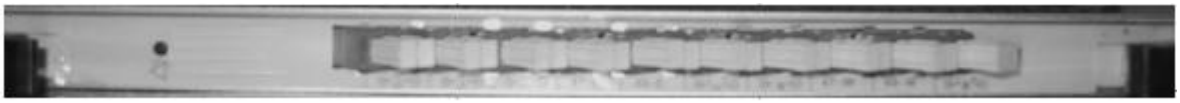

Figure41. C-OAD2-E-U-2-4749-S board front view

2.2.5 C-OAD-H-U-4-47495153-S board (example)

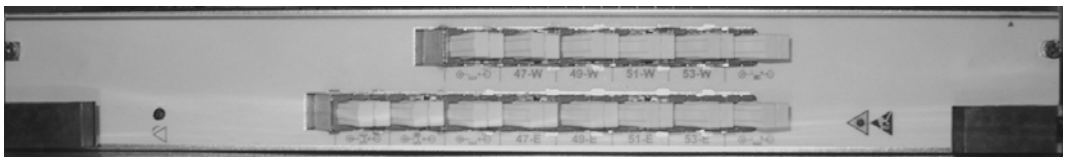

Figure42. C-OAD-H-U-4-47495153-S board front view

2.2.6 18mm dummy front panel

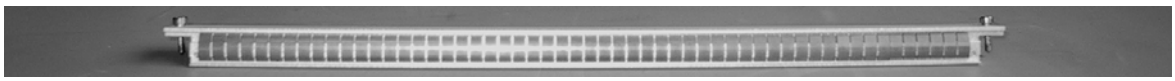

Figure43. 18mm dummy front panel view

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2.3 Power consumption and weight of the units

Table 23.Maximum power consumption of the units

Unit	Maximum Power Consumption (W)	Weight Indication (kg)
OAD	0	1.2
MDX	0	1.2
18mm Dummy Front Panel	-	0.06

N.B. 1692MSE R2.0 is passive CWDM equipment, so the power consumption is always 0.

2.4 FIT of 1692 MSE

The following table lists the FIT of main boards.

Table 24.FIT of 1692 MSE

Unit	FIT	Unit	FIT
C-MDX-U	387	C-OAD-U-2-XXXX	307
C-MDX-E-U-S	427	C-OAD-E-U-2-XXXX-S	387
C-MDX-B	299	C-OAD2-U-2-XXXX	456
C-MDX-B-S	343	C-OAD2-E-U-2-XXXX-S	537
C-MDX2-U	480	C-OAD-B-1-XX	257
C-MDX2-E-U-S	510	C-OAD-B-1-XX-S	350
C-MDX2-E-1-S	325	C-OAD2-U-4-XXXXXXXX	547
C-MDX2-E-2-XX-S	375	C-OAD2-E-U-4-XXXXXXXX-S	627
C-OAD-U-1-XX	262	C-OAD-H-4-XXXXXXXX-S	339
C-OAD-E-U-1-XX-S	342	Shelf	0
C-OAD2-U-1-XX	406	18mm dummy front panel	0
C-OAD2-E-U-1-XX-S	491	-	-

N.B. 4 main contributions are not taken into account in the FIT calculation:

- Mechanical damage
  These failures could be caused for example by poor handling, wrong packaging or incorrect transportation.
- Problems of diagnostic leading to NFF (No Failure Found)A certain number or units returned to Alcatel have been declared in failure after an error of diagnostic. These units are not in failure and are declared NFF after the reparation process. From our experience of major networks, this NFF rate is generally around 20% of returns. A higher NFF rate would mean that the diagnostic process has to be revised.
- FIT values do not apply to Installation/Commissioning failures and to the first months of the network operation.During this period, failures (reported as “early life failures” or “infant mortality”) happen at higher rates than calculated FITs, due either to incorrect installation or to the presence of weak components. It is reasonable to assume that during the first 6 months of operation, the observed failure rate can be up to twice the predicted value.
- FITs do not take into account punctual defects that cannot be predicted, like a wrong component lot/batch coming from our suppliers manufacturing process.

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2.5 Equipment connections

Only the optical external connection is used in 1692MSE R2.0.

In 1692MSE R2.0, one kind of optical connector is used: MU/SPC. They are for all passive boards.

Table 25.Optical connections in 1692MSE

Board	MU/SPC	Direction
OAD	√	45° inclined
MDX	√	45° inclined

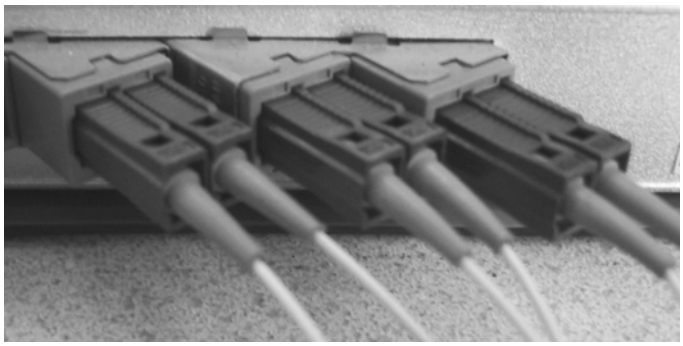

Figure44. MU/SPC optical connectors

3 UNITS DESCRIPTION

This chapter describes the cards and units of the 1692MSE Release 2.0. It gives for each card:

- A functional diagram and description
- Optical characteristics
- Front panel description

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3.1 MUX/DEMUX units (C-MDX)

The following C-MDX boards are used:

- MUX/DMX with 1310nm filter for unidirectional system: C-MDX-E-U-S
- MUX/DMX without 1310nm filter for unidirectional system: C-MDX-U
- MUX/DMX with 1310nm filter for bidirectional system: C-MDX-B-S
- MUX/DMX without 1310nm filter for bidirectional system: C-MDX-B

3.1.1 C-MDX-E-U-S

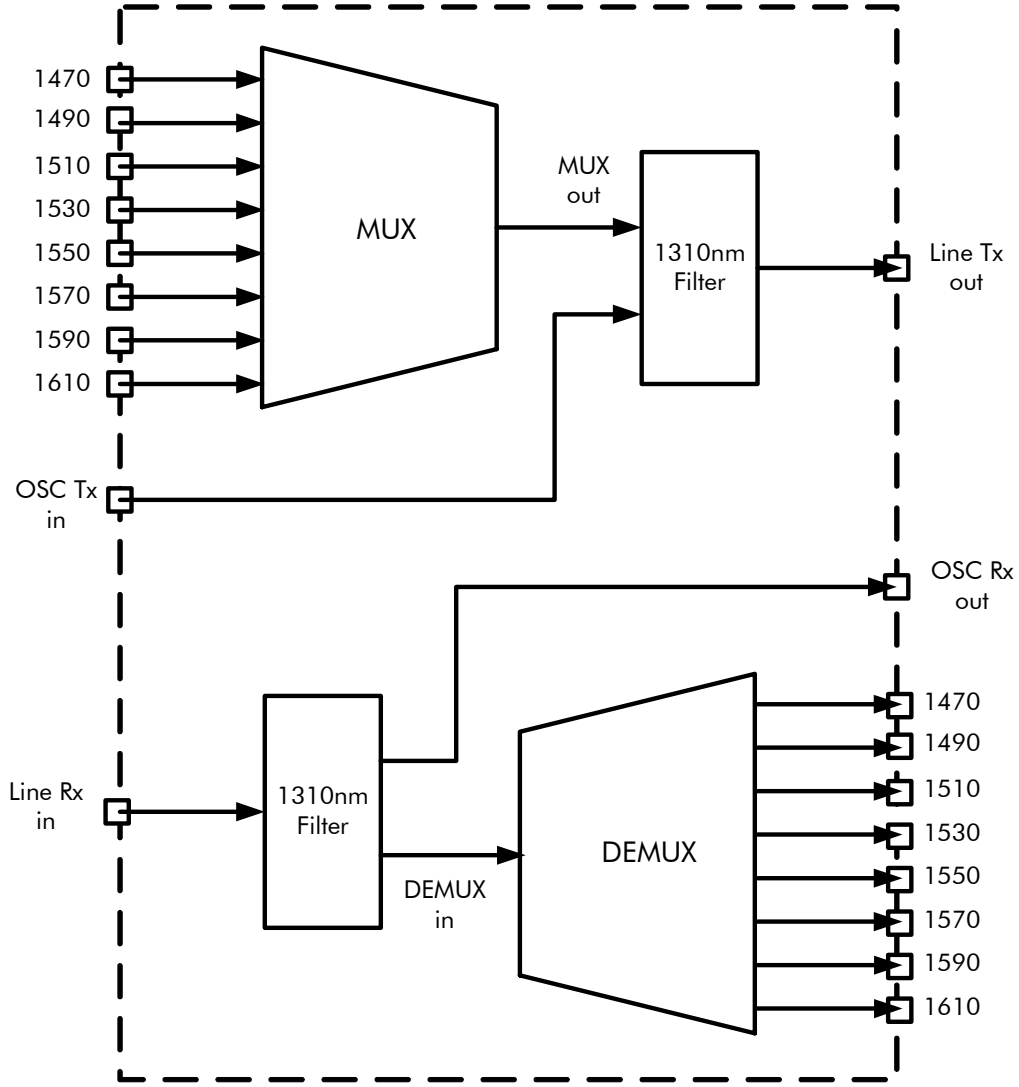

Figure45. C-MDX-E-U-S block diagram

3.1.1.1 Description

a) MUX side

The MUX component multiplexes 8 channels (CWDM grid) signals into an optical fiber. The 1310nm filter couples the MUX out signal and OSC signal into the line fiber.

b) DEMUX side

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At the receive side, the 1310nm filter splits the line signal into two channel signals. One is sent to the OSC board, the other is demultiplexed into 8 channel signals by a DEMUX component.

3.1.1.2 Front panel description

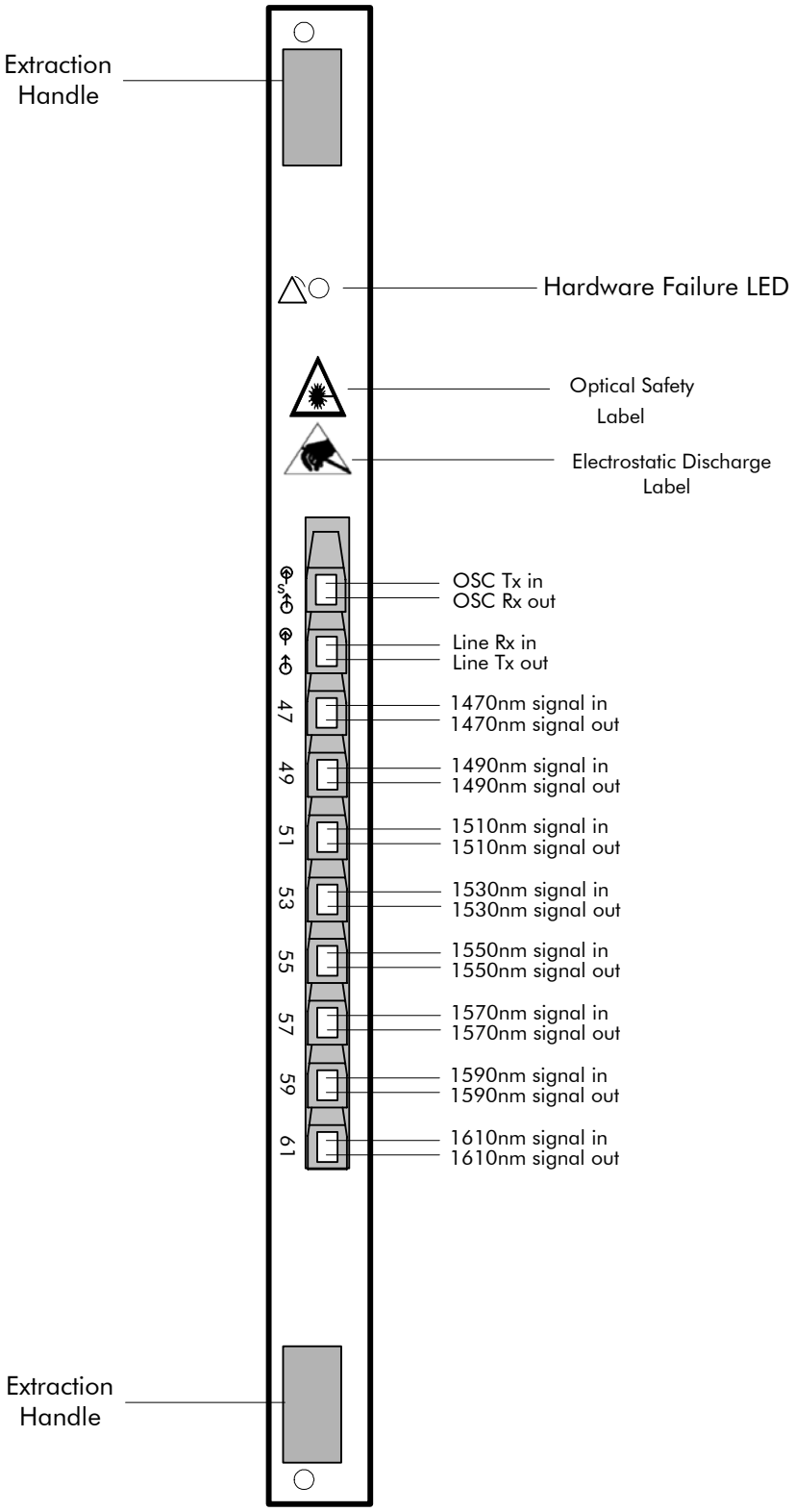

Figure46. Front panel of C-MDX-E-U-S board

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3.1.1.3 Optical characteristics

Table 26.C-MDX-E-U-S optical characteristics

MUX Side		
Insertion Losses	**Value**	**Unit**
OSC In (1310nm)->Line out (Max)	1	dB
CH1 In ->LINE OUT (1470nm) (Max)	1.4	dB
CH2 In ->LINE OUT (1490nm) (Max)	1.7	dB
CH3 In ->LINE OUT (1510nm) (Max)	2.0	dB
CH4 In ->LINE OUT (1530nm) (Max)	2.3	dB
CH5 In ->LINE OUT (1550nm) (Max)	2.6	dB
CH6 In ->LINE OUT (1570nm) (Max)	2.9	dB
CH7 In ->LINE OUT (1590nm) (Max)	3.2	dB
CH8 In ->LINE OUT (1610nm) (Max)	3.5	dB
Channel passband at -0.5dB (include channel center wavelength -6～+8 range)	14	nm
DEMUX Side		
Insertion Losses	**Value**	**Unit**
LINE IN->OSC Out (1310nm)(Max)	1	dB
LINE IN->CH1 Out (1470nm) (Max)	1.4	dB
LINE IN->CH2 Out (1490nm) (Max)	3.5	dB
LINE IN->CH3 Out (1510nm) (Max)	3.2	dB
LINE IN->CH4 Out (1530nm) (Max)	2.9	dB
LINE IN->CH5 Out (1550nm) (Max)	2.6	dB
LINE IN->CH6 Out (1570nm) (Max)	2.3	dB
LINE IN->CH7 Out (1590nm) (Max)	2.0	dB
LINE IN->CH8 Out (1610nm) (Max)	1.7	dB
Channel passband at -0.5dB (include channel center wavelength -6～+8 range)	14	nm
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.1.1.4 Front panel wiring

Table 27.Front panel wiring of C-MDX-E-U-S board

Name	Signal
OSC Tx in	Supervision transmission input signal (from OSC board)
OSC Rx out	Supervision reception output signal (to OSC board)
Line Rx in	Line Reception input signal (from line)
Line Tx out	Line Transmission output signal (to line)
## nm signal in	WDM transmission input signal (from corresponding transponder)
## nm signal out	WDM reception output signal (to corresponding transponder)

N.B. ## means from 1470 to 1610.

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3.1.2 C-MDX-U

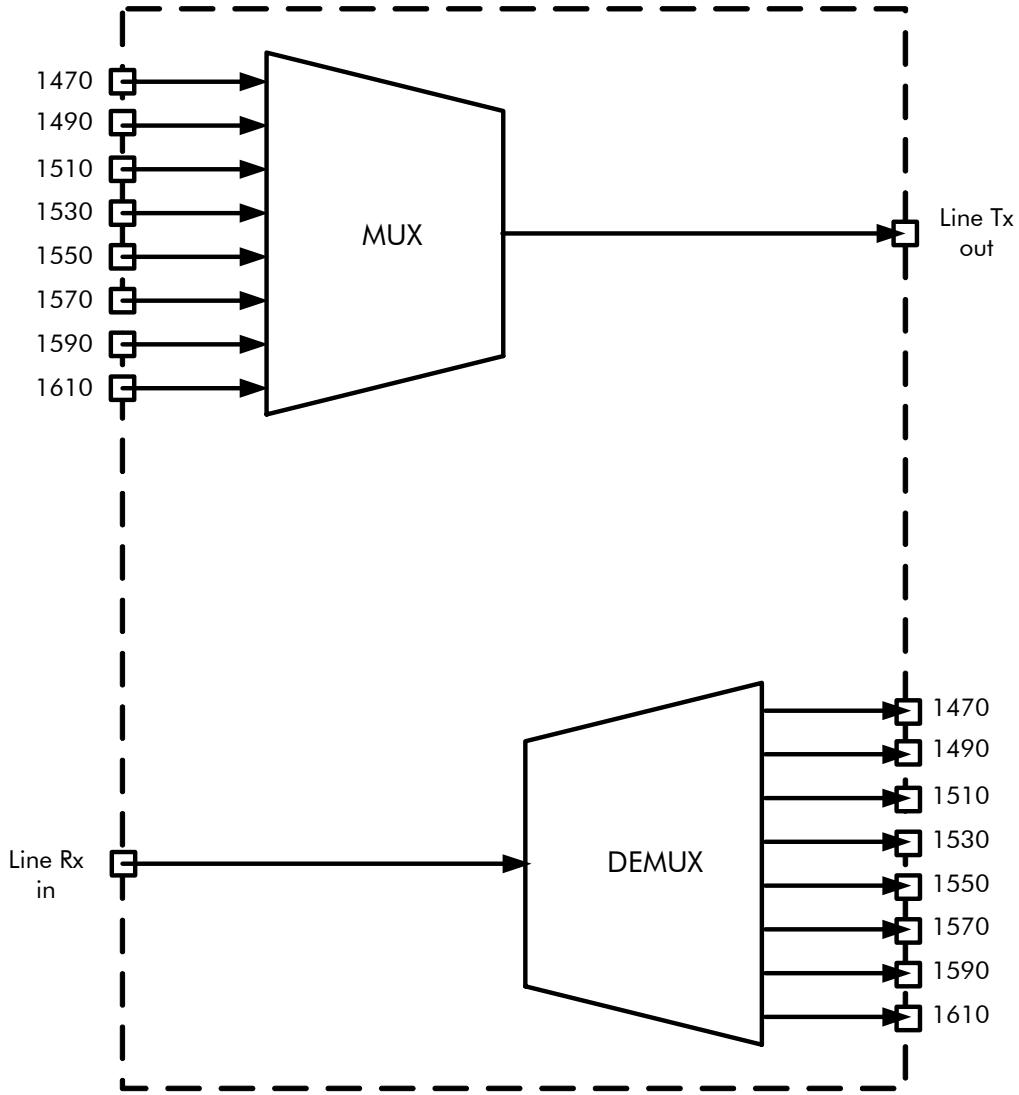

Figure47. C-MDX-U block diagram

3.1.2.1 Description

a) MUX side
The MUX component multiplexes 8 channel (CWDM grid) signals into an optical fiber.

b) DEMUX side
The DEMUX component demultiplexes the line signal into 8 channel signals.

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3.1.2.2 Front panel description

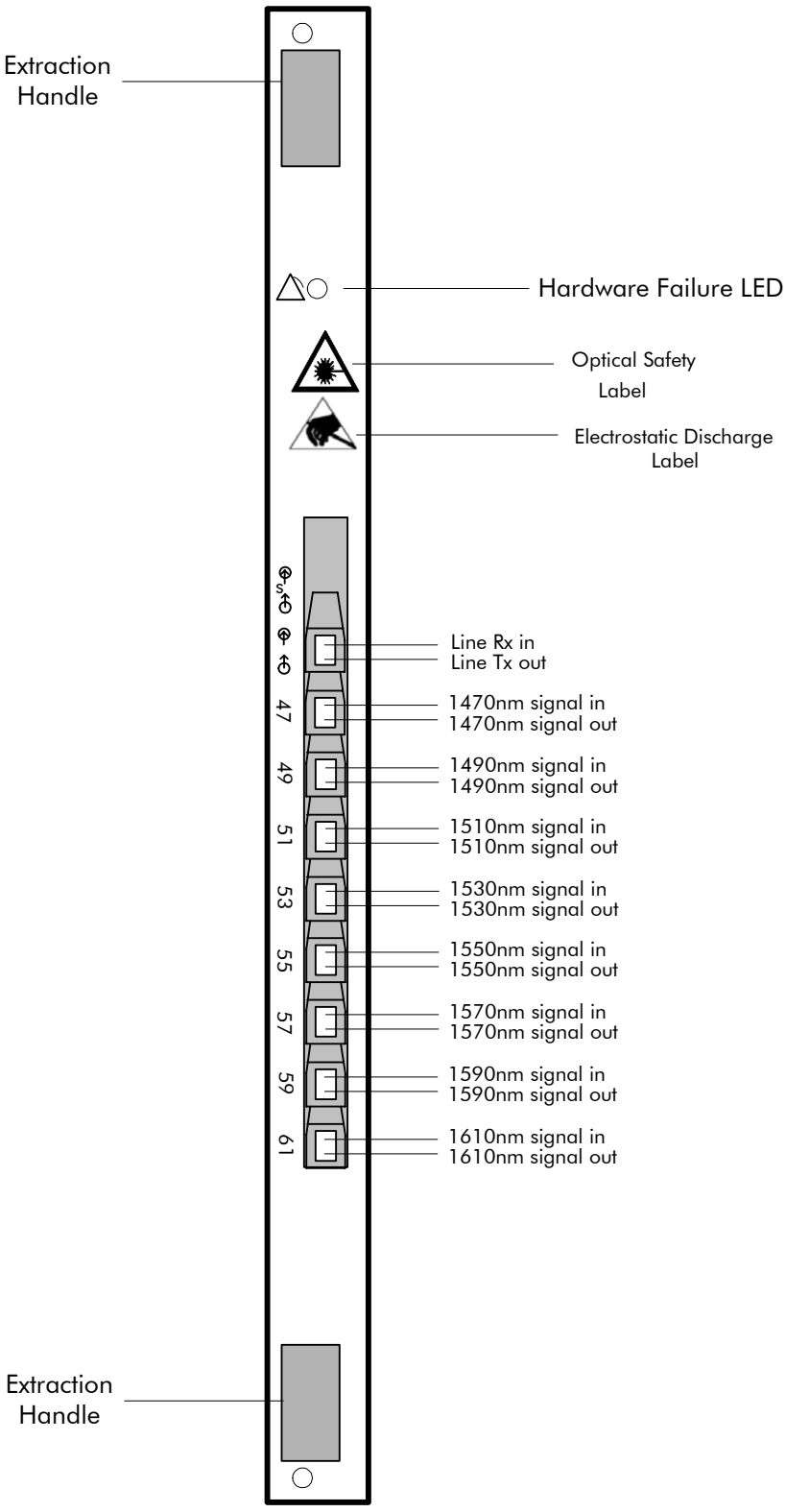

Figure48. Front panel of C-MDX-U board

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3.1.2.3 Optical characteristics

Table 28.C-MDX-U optical characteristics

MUX Side		
Insertion Losses	**Value**	**Unit**
CH1 In ->LINE OUT (1470nm) (Max)	0.9	dB
CH2 In ->LINE OUT (1490nm) (Max)	1.2	dB
CH3 In ->LINE OUT (1510nm) (Max)	1.5	dB
CH4 In ->LINE OUT (1530nm) (Max)	1.8	dB
CH5 In ->LINE OUT (1550nm) (Max)	2.1	dB
CH6 In ->LINE OUT (1570nm) (Max)	2.4	dB
CH7 In ->LINE OUT (1590nm) (Max)	2.7	dB
CH8 In ->LINE OUT (1610nm) (Max)	3	dB
Channel passband at -0.5dB (include channel center wavelength -6～+8 range)	14	nm
DEMUX Side		
Insertion Losses	**Value**	**Unit**
LINE IN->CH1 Out (1470nm) (Max)	0.9	dB
LINE IN->CH2 Out (1490nm) (Max)	3	dB
LINE IN->CH3 Out (1510nm) (Max)	2.7	dB
LINE IN->CH4 Out (1530nm) (Max)	2.4	dB
LINE IN->CH5 Out (1550nm) (Max)	2.1	dB
LINE IN->CH6 Out (1570nm) (Max)	1.8	dB
LINE IN->CH7 Out (1590nm) (Max)	1.5	dB
LINE IN->CH8 Out (1610nm) (Max)	1.2	dB
Channel passband at -0.5dB (include channel center wavelength -6～+8 range)	14	nm
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.1.2.4 Front panel wiring

Table 29.Front panel wiring of C-MDX-U board

Name	**Signal**
Line Rx in	Line Reception input signal (from line)
Line Tx out	Line Transmission output signal (to line)
## nm signal in	WDM transmission input signal (from corresponding transponder)
## nm signal out	WDM reception output signal (to corresponding transponder)

N.B. ## means from 1470 to 1610.

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3.1.3 C-MDX-B-S

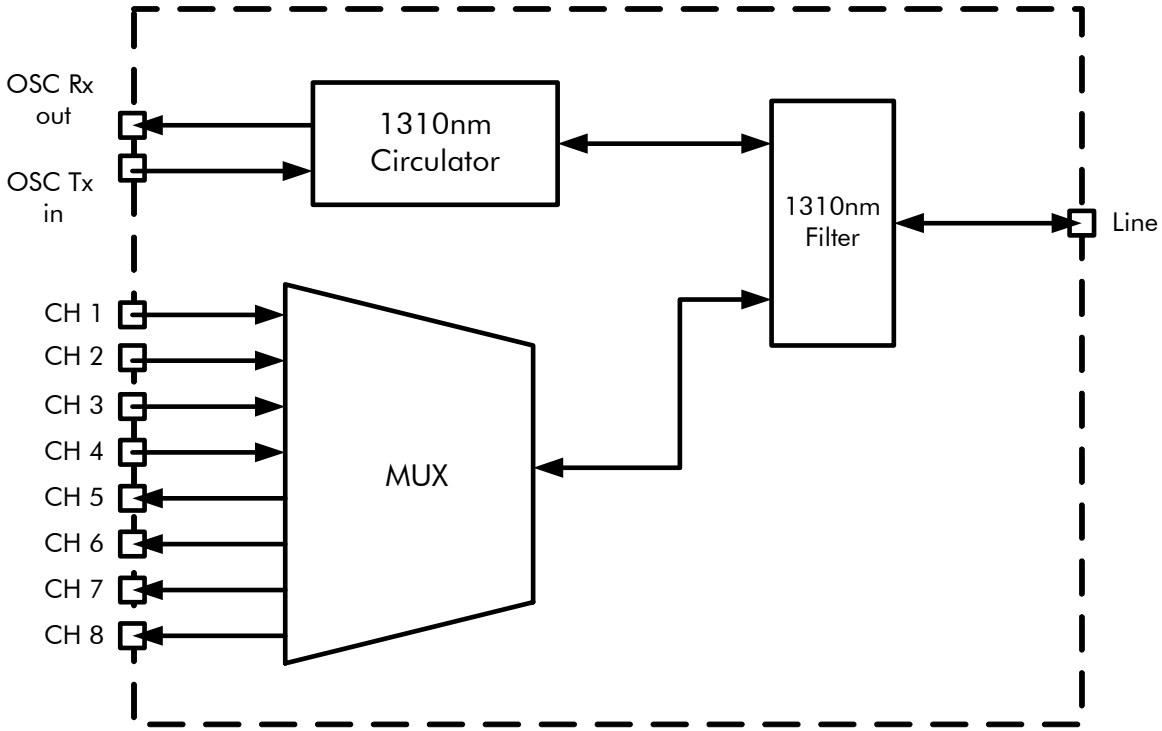

Figure49. C-MDX-B-S block diagram

3.1.3.1 Description

As mentioned before, the 8:1 multiplexer can also be used in bidirectional line terminal configuration to multiplex/demultiplex signals. In this application, 1310nm circulators are used to multiplex/demultiplex bidirectional 1310nm wavelengths of the OSC. An extra 1310±30nm filter is also used to avoid the 1310nm multiplexing affecting the 1550nm transmission.

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3.1.3.2 Front panel description

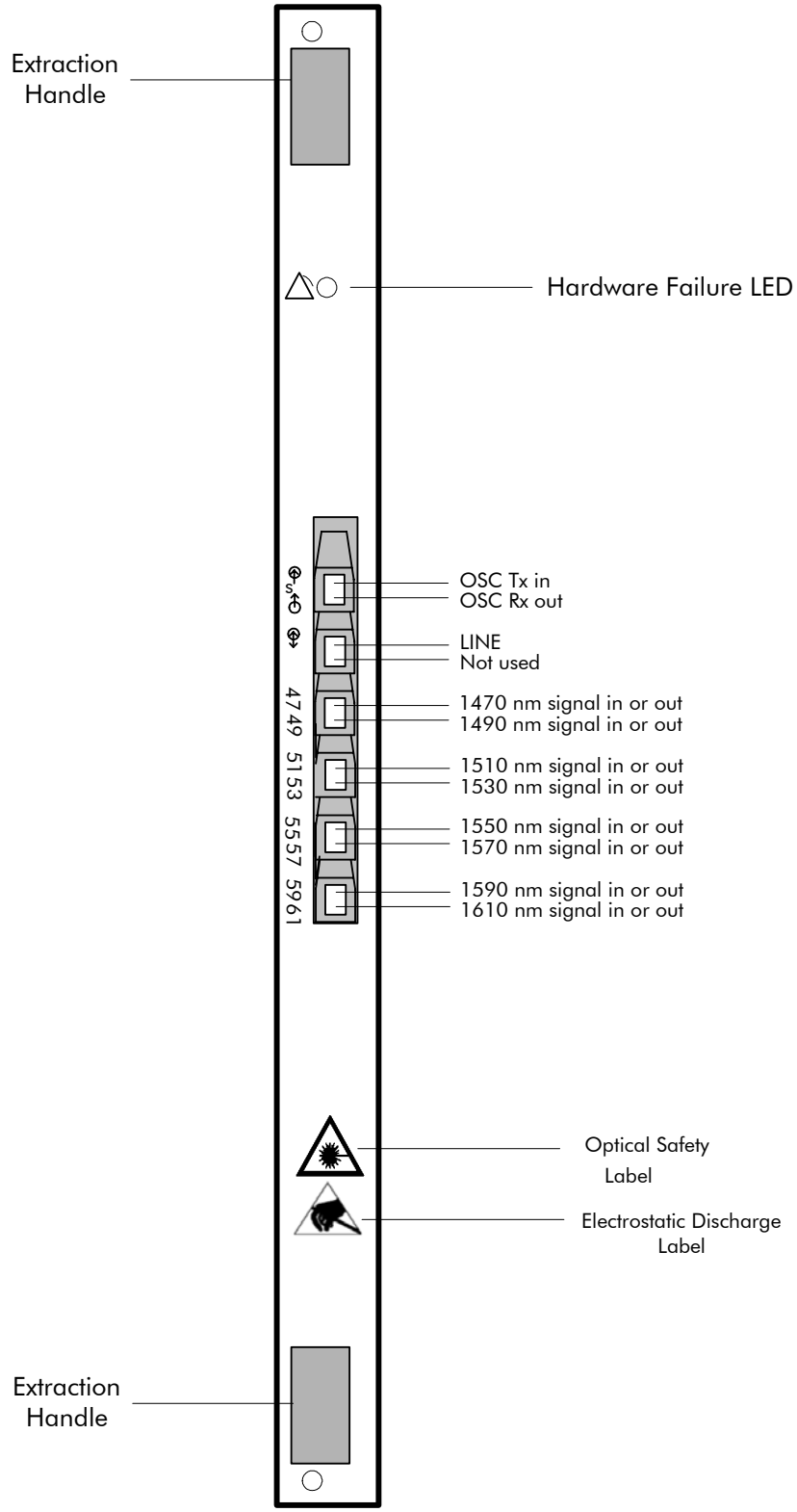
Extraction Handle
Hardware Failure LED
OSC Tx in
OSC Rx out
LINE
Not used
1470 nm signal in or out
1490 nm signal in or out
1510 nm signal in or out
1530 nm signal in or out
1550 nm signal in or out
1570 nm signal in or out
1590 nm signal in or out
1610 nm signal in or out
47 49 51 53 55 57 59 61
Optical Safety Label
Electrostatic Discharge Label
Extraction Handle

Figure50. Front panel of C-MDX-B-S board

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3.1.3.3 Optical characteristics

Table 30.C-MDX-B-S optical characteristics

Insertion Losses	Value	Unit
I/O <->OSC channel (1310nm)(Max)	2	dB
I/O <->CH1 (1470nm) (Max)	1.4	dB
I/O <->CH2 (1490nm) (Max)	1.7	dB
I/O <->CH3 (1510nm) (Max)	2.0	dB
I/O <->CH4 (1530nm) (Max)	2.3	dB
I/O <->CH5 (1550nm) (Max)	2.6	dB
I/O <->CH6 (1570nm) (Max)	2.9	dB
I/O <->CH7 (1590nm) (Max)	3.2	dB
I/O <->CH8 (1610nm) (Max)	3.5	dB
Channel passband at -0.5dB (include channel center wavelength -6～+8 range)	14	nm
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.1.3.4 Front panel wiring

Table 31.Front panel wiring of C-MDX-B-S board

Name	Signal
OSC Tx in	Supervision transmission input signal (from OSC board)
OSC Rx out	Supervision reception output signal (to OSC board)
Line	Line signal (from/to line)
Not used	-
## nm signal in or out	WDM signal (from/to corresponding transponder)

N.B. ## means from 1470 to 1610.

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3.1.4 C-MDX-B

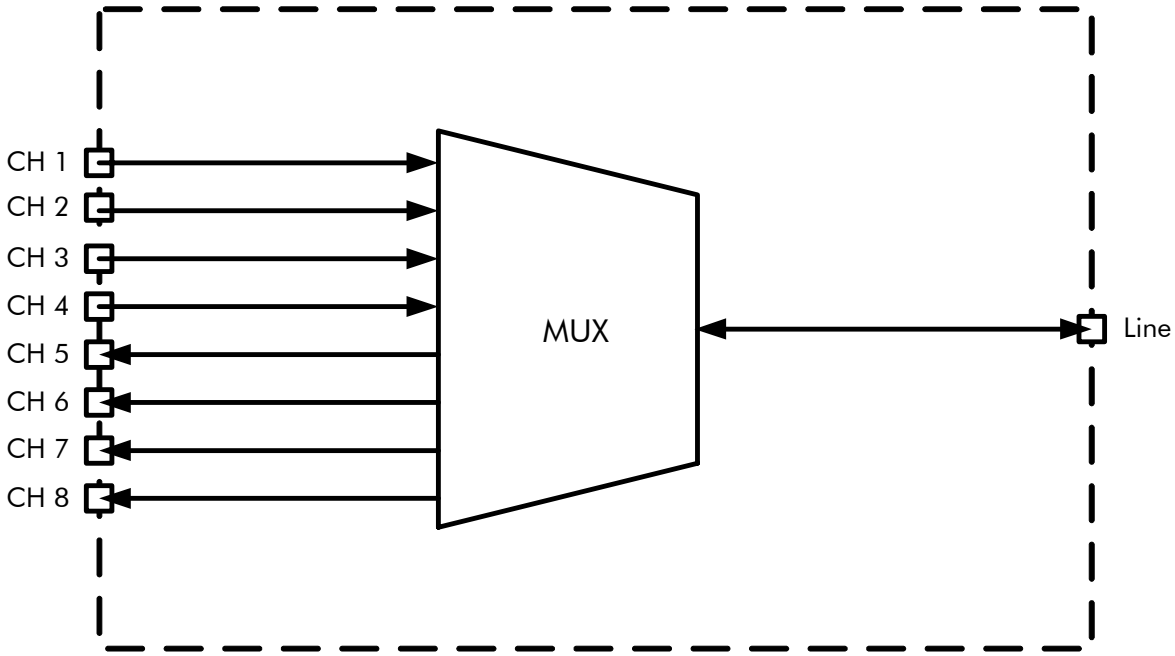

Figure51. C-MDX-B block diagram

3.1.4.1 Description

The 8:1 multiplexer can be used in bidirectional line terminal configuration to multiplex/demultiplex signals.

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3.1.4.2 Front panel description

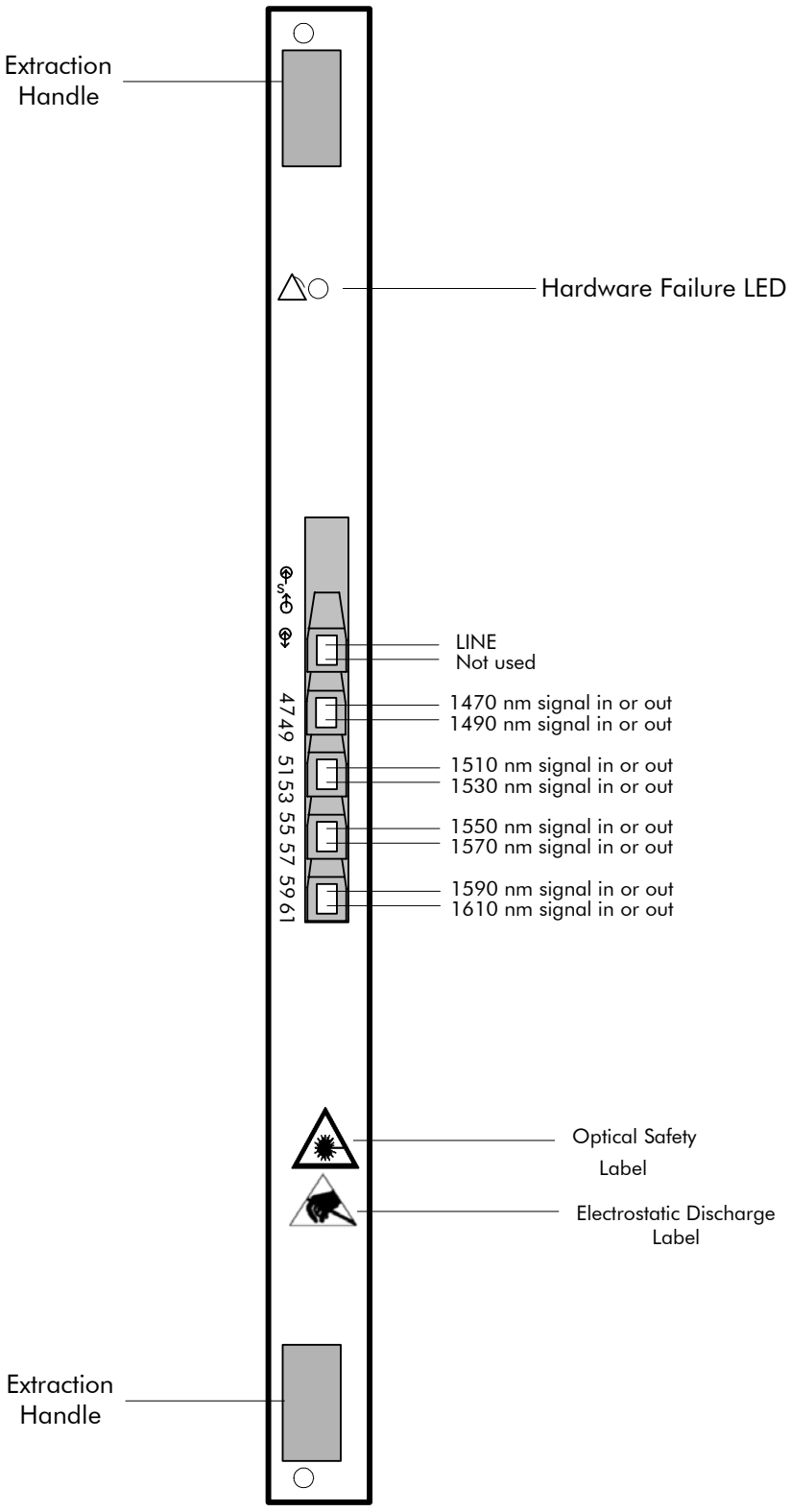
Extraction Handle
Hardware Failure LED
LINE
Not used
1470 nm signal in or out
1490 nm signal in or out
1510 nm signal in or out
1530 nm signal in or out
1550 nm signal in or out
1570 nm signal in or out
1590 nm signal in or out
1610 nm signal in or out
47 49 51 53 55 57 59 61
Optical Safety Label
Electrostatic Discharge Label
Extraction Handle

Figure52. Front panel of C-MDX-B board

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3.1.4.3 Optical characteristics

Table 32.C-MDX-B optical characteristics

Insertion Losses	Value	Unit
I/O <->CH1 (1470nm) (Max)	0.9	dB
I/O <->CH2 (1490nm) (Max)	1.2	dB
I/O <->CH3 (1510nm) (Max)	1.5	dB
I/O <->CH4 (1530nm) (Max)	1.8	dB
I/O <->CH5 (1550nm) (Max)	2.1	dB
I/O <->CH6 (1570nm) (Max)	2.4	dB
I/O <->CH7 (1590nm) (Max)	2.7	dB
I/O <->CH8 (1610nm) (Max)	3	dB
Channel passband at -0.5dB (include channel center wavelength -6～+8 range)	14	nm
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.1.4.4 Front panel wiring

Table 33.Front panel wiring of C-MDX-B board

Name	Signal
Line	Line signal (from/to line)
Not used	-
## nm signal in or out	WDM signal (from/to corresponding transponder)

N.B. ## means from 1470 to 1610.

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3.2 MUX/DEMUX units (C-MDX2)

The following C-MDX2 boards are used:

- MUX/DMX2 with 1310nm filter for unidirectional system: C-MDX2-E-U-S
- MUX/DMX2 without 1310nm filter for unidirectional system: C-MDX2-U
- 1-channel MUX/DMX2 with 1310nm filter for unidirectional system: C-MDX2-E-1-S
- 2-channel MUX/DMX2 with 1310nm filter for unidirectional system: C-MDX2-E-2-XX-S

3.2.1 C-MDX2-E-U-S

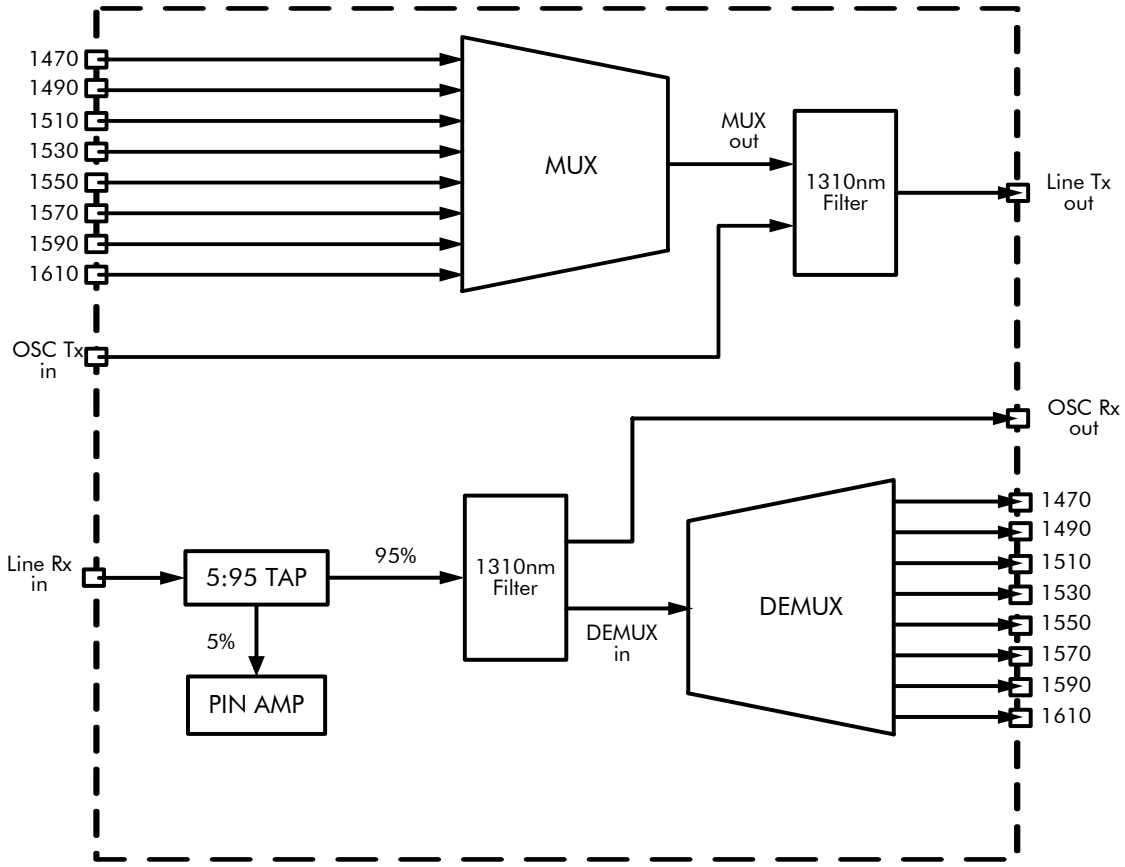

Figure53. C-MDX2-E-U-S block diagram

3.2.1.1 Description

a) MUX side

The MUX component multiplexes 8 channel (CWDM grid) signals into an optical fiber. The 1310nm filter couples the MUX out signal and OSC signal into the line fiber.

b) DEMUX side

At the receive side, the 5:95 TAP splits the line signal into two channels. One (95%) is sent to 1310nm filter splitter; the other (5%) is sent to a PIN & amplification circuit for LOS detection. The 1310nm filter splits the input signal into two channel signals. One is sent to OSC board, the other is demultiplexed into 8 channels signals by the DEMUX component. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

The front panel and front panel wiring are the same as the C-MDX-E-U-S unit.

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3.2.2 C-MDX2-U

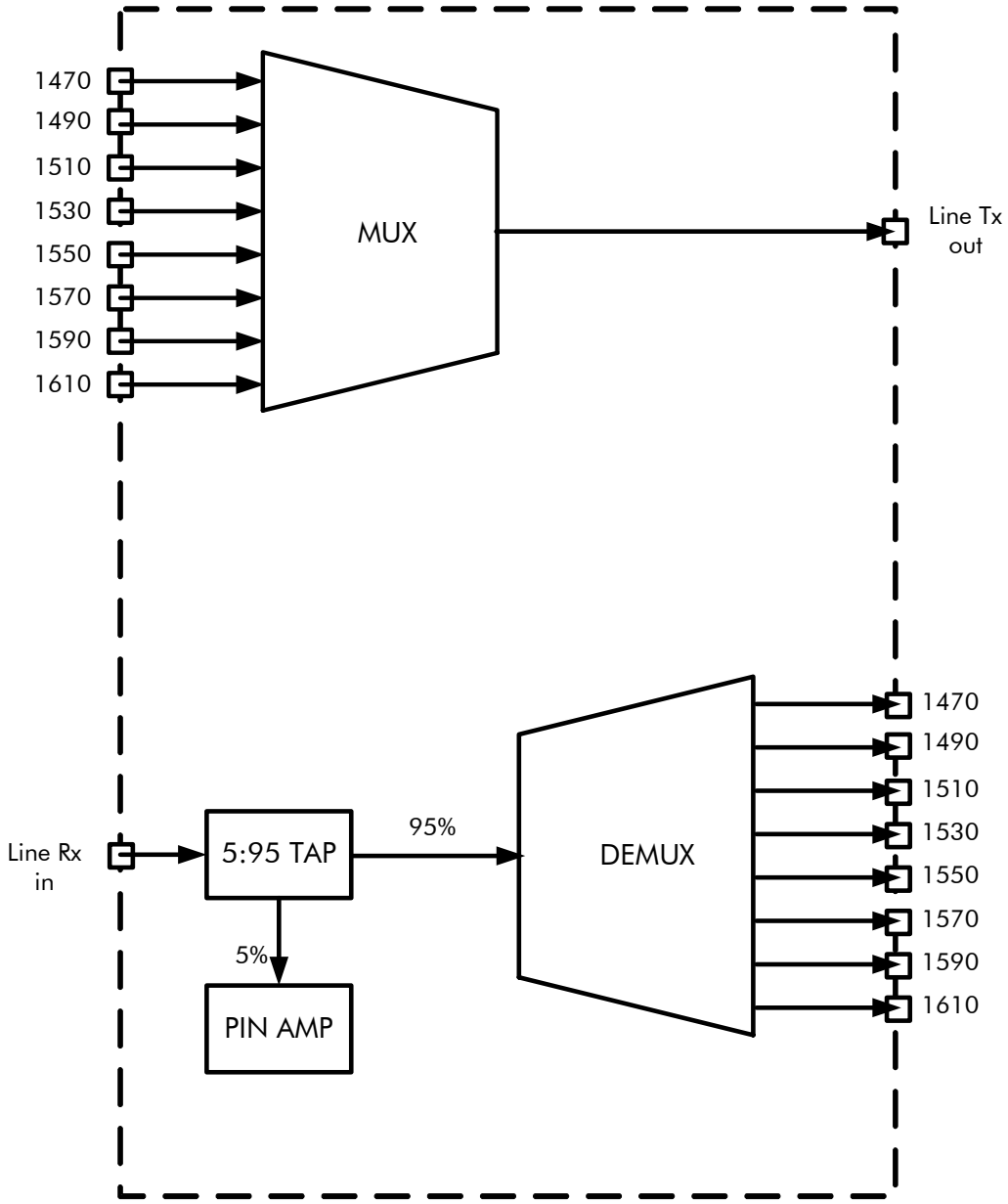

Figure54. C-MDX2-U block diagram

3.2.2.1 Description

a) MUX side
The MUX component multiplexes 8 channel (CWDM grid) signals into an optical fiber.

b) DEMUX side
At the receive side, the 5:95 TAP splits the line signal into two channels. One (95%) is sent to the DEMUX component; the other (5%) is sent to a PIN & amplification circuit for LOS detection. The DEMUX component demultiplexes the line signal into 8 channel signals. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

The front panel and front panel wiring are the same as the C-MDX-U unit.

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3.2.3 C-MDX2-E-1-S

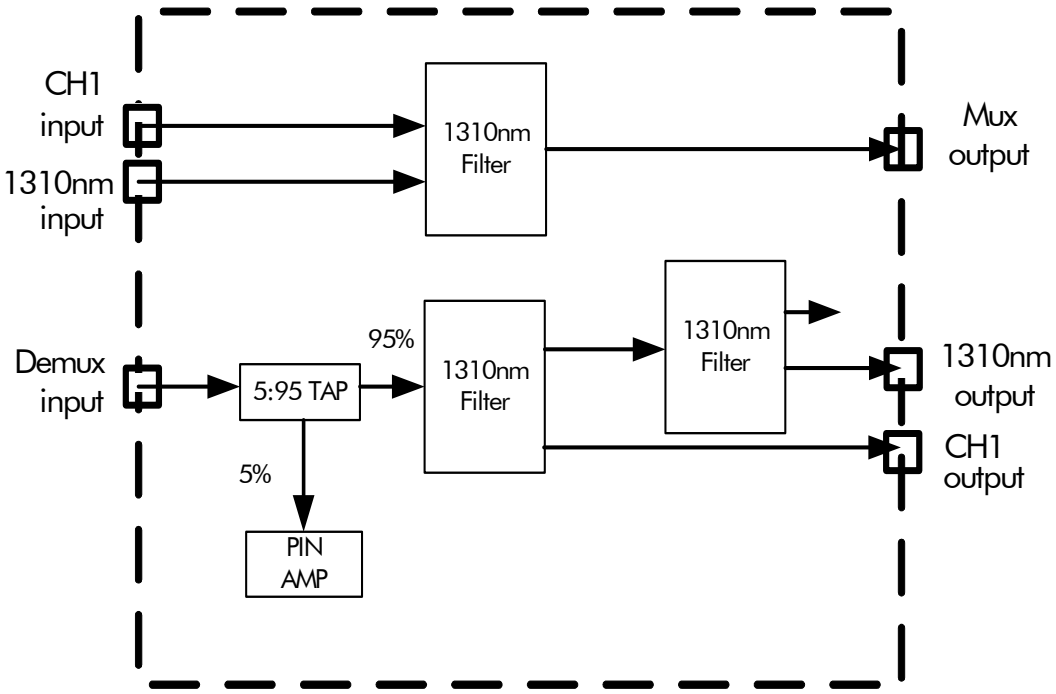

Figure55. C-MDX2-E-1-S block diagram

3.2.3.1 Description

The C-MDX2-E-1-S boards are only for the CPE application.

This board is designed to multiplex/demultiplex one channel wavelengths to/from a fiber. It provides insertion/extraction of the 1310nm OSC signal or the 1310nm SDH signal.

Input optical signal LOS detection is integrated into the unit, but this detection function is not available in R2.0, which is a passive equipment.

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3.2.3.2 Front panel description

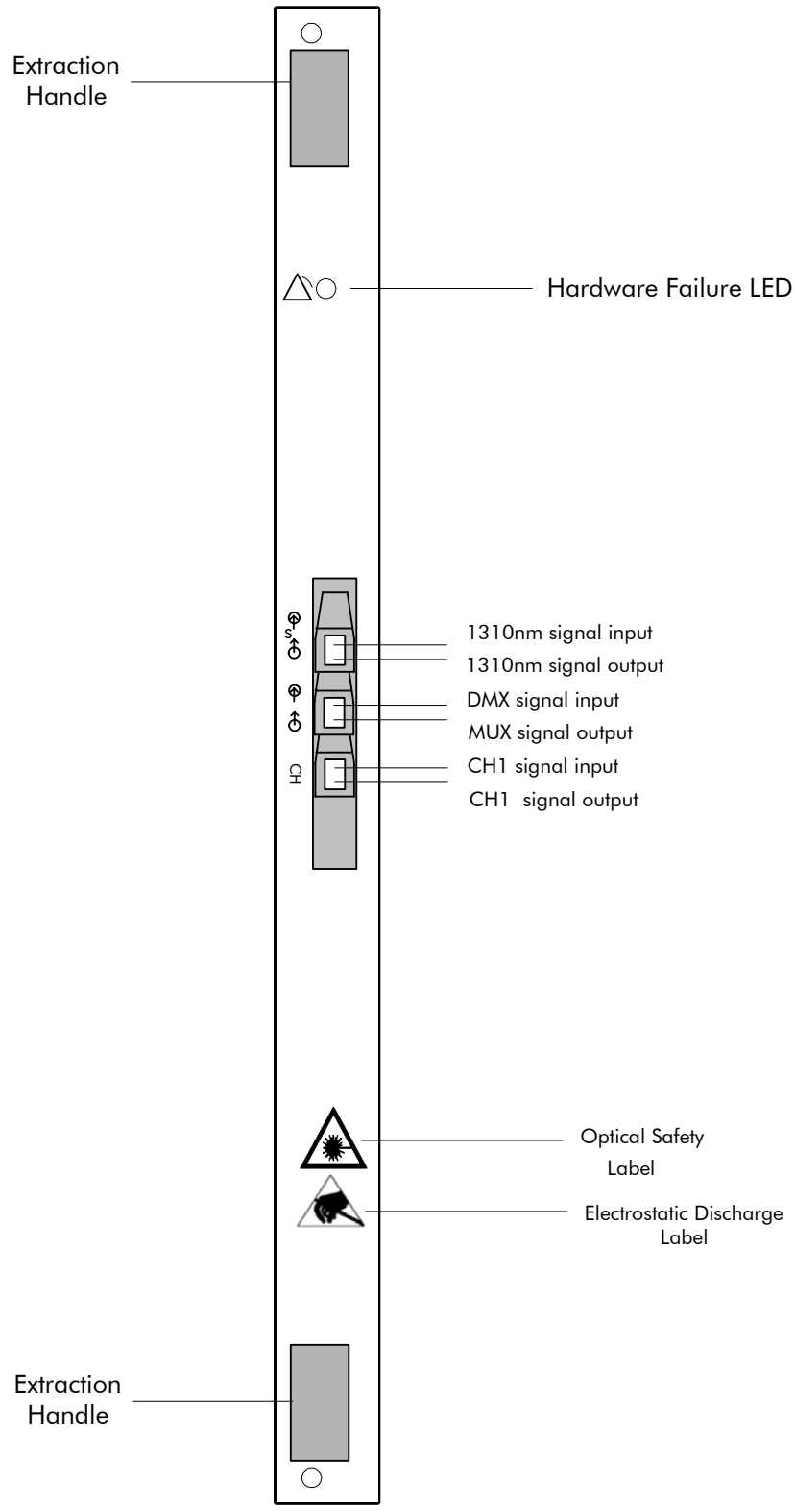

Figure56. Front panel of C-MDX2-E-1-S board

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3.2.3.3 Optical characteristics

Table 34.C-MDX2-E-1-S optical characteristics

MUX Side		
Insertion Losses	**Value**	**Unit**
OSC In->MUX (1310nm)(Max)	1	dB
CH1 In->MUX (Max)	0.9	dB
DEMUX Side		
Insertion Losses	**Value**	**Unit**
DEMUX->OSC Out (1310nm)(Max)	1.5	dB
DEMUX->CH1 Out (Max)	1.9	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.2.3.4 Front panel wiring

Table 35.Front panel wiring of C-MDX2-E-1-S board

Name	**Signal**
1310nm signal input	Supervision transmission input signal (from OSC board) or other1310nm input
1310nm signal output	Supervision reception output signal (to OSC board) or other1310nm output
DMX signal input	Line Reception input signal (from line)
MUX signal output	Line Transmission output signal (to line)
CH1 signal input	WDM transmission input signal (from corresponding transponder)
CH1 signal output	WDM reception output signal (to corresponding transponder)

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3.2.4 C-MDX2-E-2-XX-S

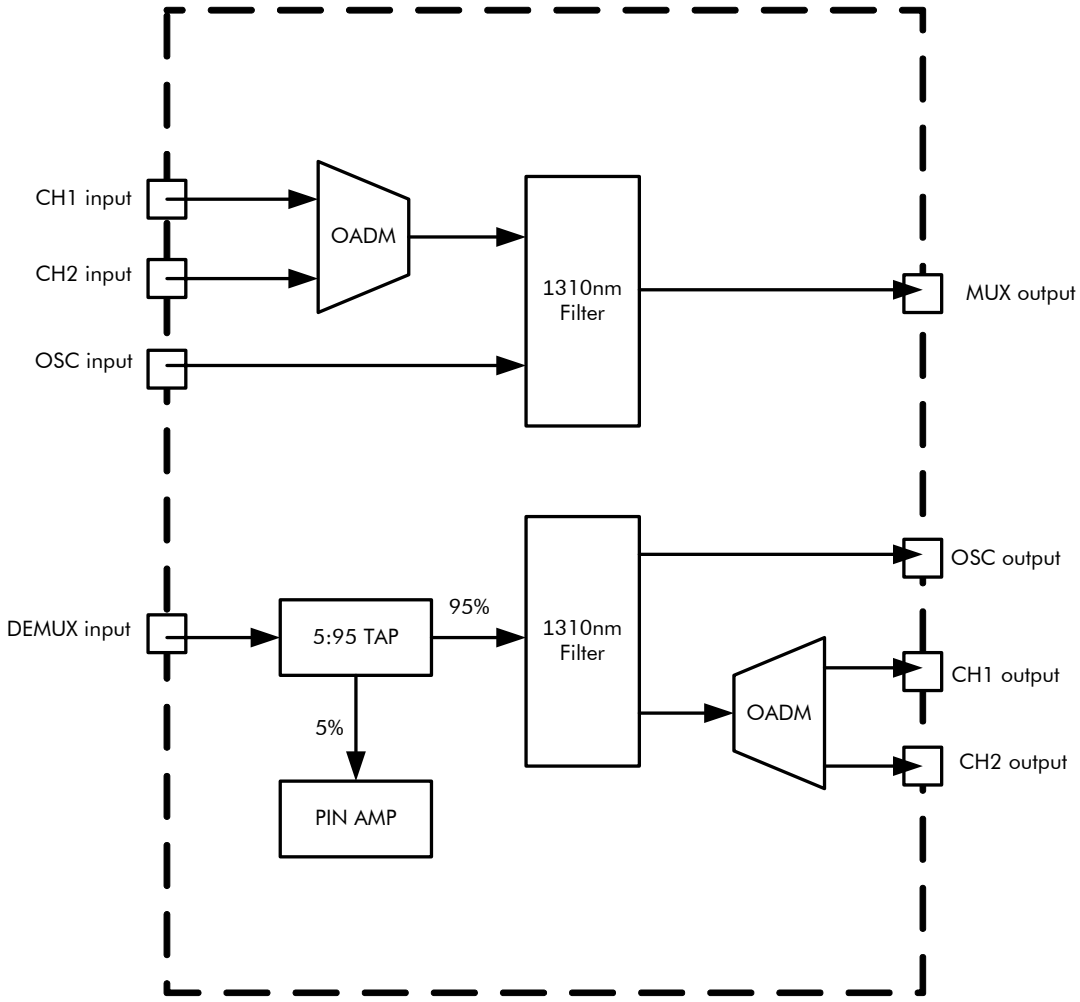

Figure57. C-MDX2-E-2-XX-S block diagram

3.2.4.1 Description

The C-MDX2-E-2-XX-S boards are only for the CPE application.

This board is designed to multiplex/demultiplex two channels wavelengths to/from a fiber. It provides insertion/extraction of the 1310nm OSC signal or the 1310nm SDH signal.

Input optical signal LOS detection is integrated into the unit, but this detection function is not available in R2.0, which is a passive equipment.

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3.2.4.2 Front panel description

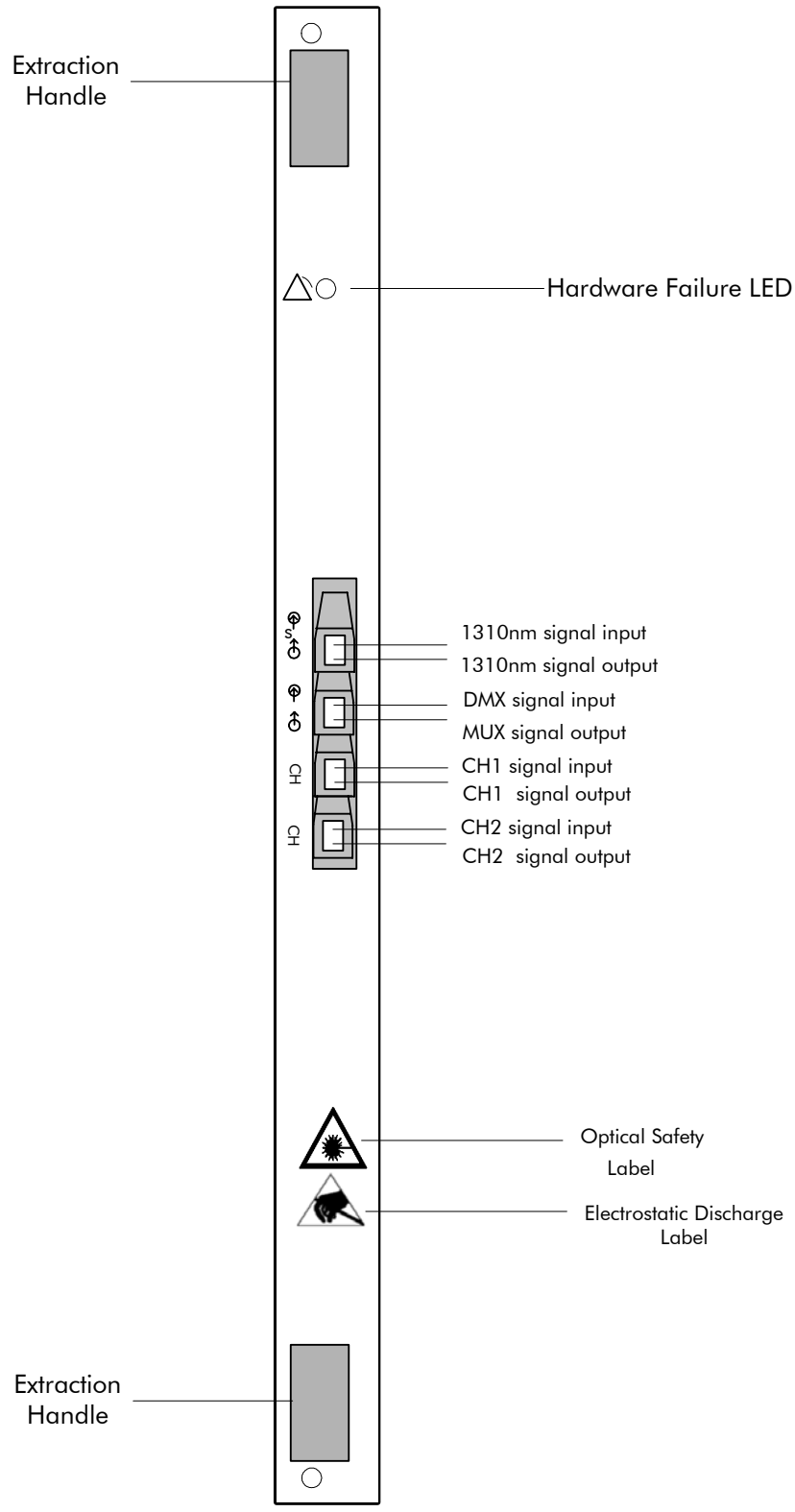

Figure58. Front panel of C-MDX2-E-2-XX-S board

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3.2.4.3 Optical characteristics

Table 36.Optical parameter of C-MDX2-E-2-XX-S

MUX Side		
Insertion Losses	**Value**	**Unit**
OSC In->MUX (1310nm)(Max)	1	dB
CH1/2 In->MUX (Max)	1.8	dB
Channel passband at -0.5dB(include channel center wavelength -6～+8 range)	14	nm
DEMUX Side		
Insertion Losses	**Value**	**Unit**
DEMUX->OSC Out (1310nm)(Max)	1.5	dB
DEMUX->CH1/2 Out (Max)	2.3	dB
Channel passband at -0.5dB (include channel center wavelength -6～+8 range)	14	nm
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.2.4.4 Front panel wiring

Table 37.Front panel wiring of C-MDX2-E-2-XX-S board

Name	**Signal**
1310nm signal input	Supervision transmission input signal (from OSC board) or other1310nm input
1310nm signal output	Supervision reception output signal (to OSC board) or other1310nm output
DMX signal input	Line Reception input signal (from line)
MUX signal output	Line Transmission output signal (to line)
CH1 signal input	WDM transmission input signal (from corresponding transponder)
CH1 signal output	WDM reception output signal (to corresponding transponder)
CH2 signal input	WDM transmission input signal (from corresponding transponder)
CH2 signal output	WDM reception output signal (to corresponding transponder)

N.B. CH1 can be 1470nm, 1510nm, 1550nm, or 1590nm.
CH2 can be 1490nm, 1530nm, 1570nm, or 1610nm.

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3.3 OADM units (C-OAD)

The following C-OAD boards are used:

- Unidirectional 1 Add & Drop C-OAD with 1310nm filter: C-OAD-E-U-1-XX-S
- Unidirectional 1 Add & Drop C-OAD without 1310nm filter: C-OAD-U-1-XX
- Unidirectional 2 Add & Drop C-OAD with 1310nm filter: C-OAD-E-U-2-XXXX-S
- Unidirectional 2 Add & Drop C-OAD without 1310nm filter: C-OAD-U-2-XXXX
- Bidirectional 1 Add/Drop C-OAD with 1310nm filter: C-OAD-B-1-XX-S
- Bidirectional 1 Add/Drop C-OAD without 1310nm filter: C-OAD-B-1-XX
- Unidirectional 4 Add & Drop C-OAD with 1310nm filter for harden temperature: C-OAD-H-U-4-XXXXXXXX-S

3.3.1 C-OAD-E-U-1-XX-S

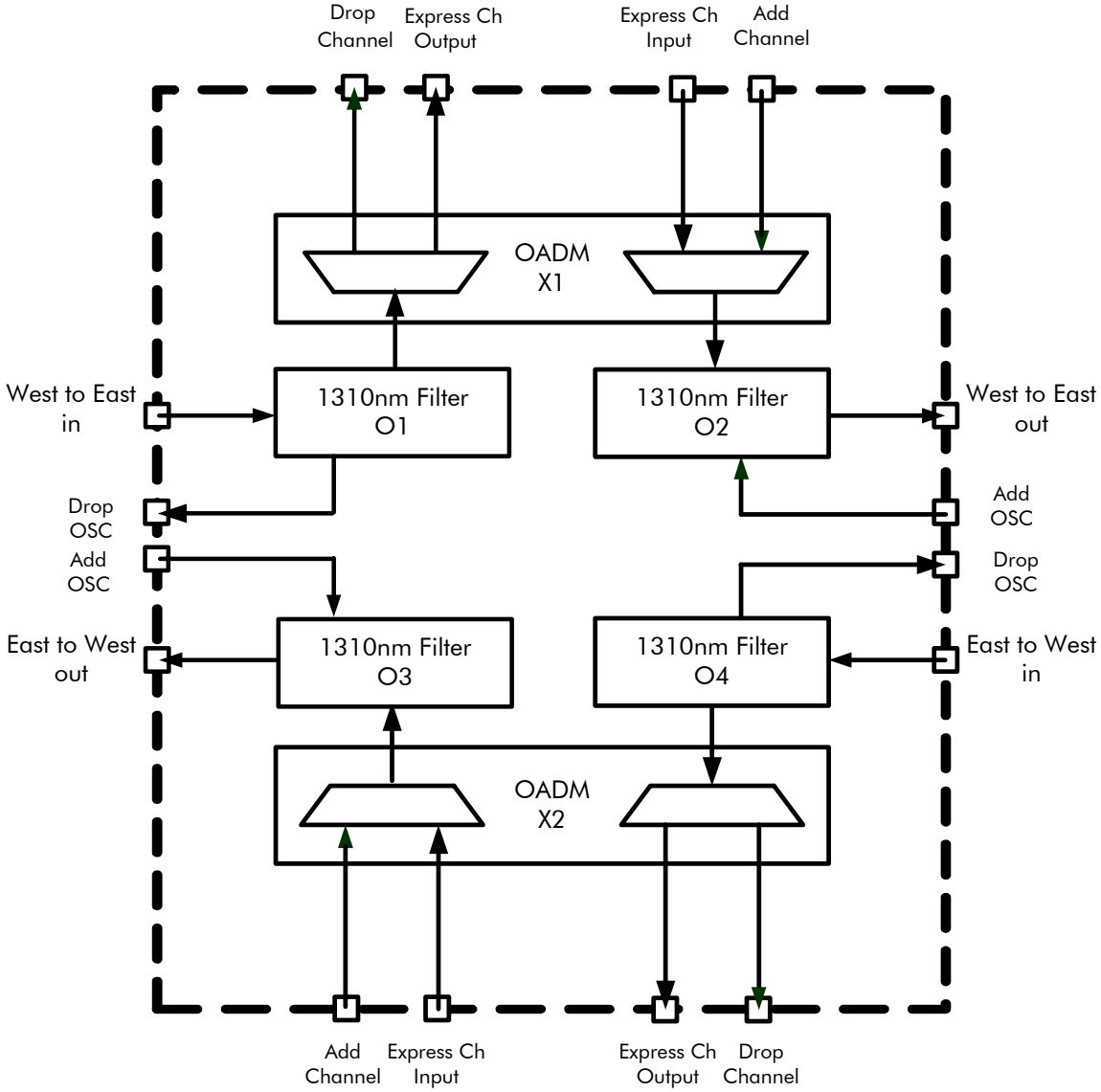

Figure59. C-OAD-E-U-1-XX-S block diagram

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3.3.1.1 Description

This board (C-OAD-E-U-1-XX-S) is used to add and drop **ONE Channel** per direction in the unidirectional CWDM system; the added/dropped channel is from/to the transponder board. The other channels are passed through the C-OAD board.

The OSC 1310nm signal is also added/dropped by this board. The dropped OSC signal is sent to the OSC board; the added OSC signal comes from the OSC board.

All channels can be added and dropped. There are 8 different 1-channel C-OAD boards according to the different wavelengths; the wavelengths are defined as in the following table.

Table 38.1-channel C-OAD module for unidirectional application

Number (XX)	4747	4949	5151	5353	5555	5757	5959	6161
Add/Drop Channels (nm)	1470	1490	1510	1530	1550	1570	1590	1610

There are two OADM modules (one OADM module for each direction) in the board.

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3.3.1.2 Front panel description

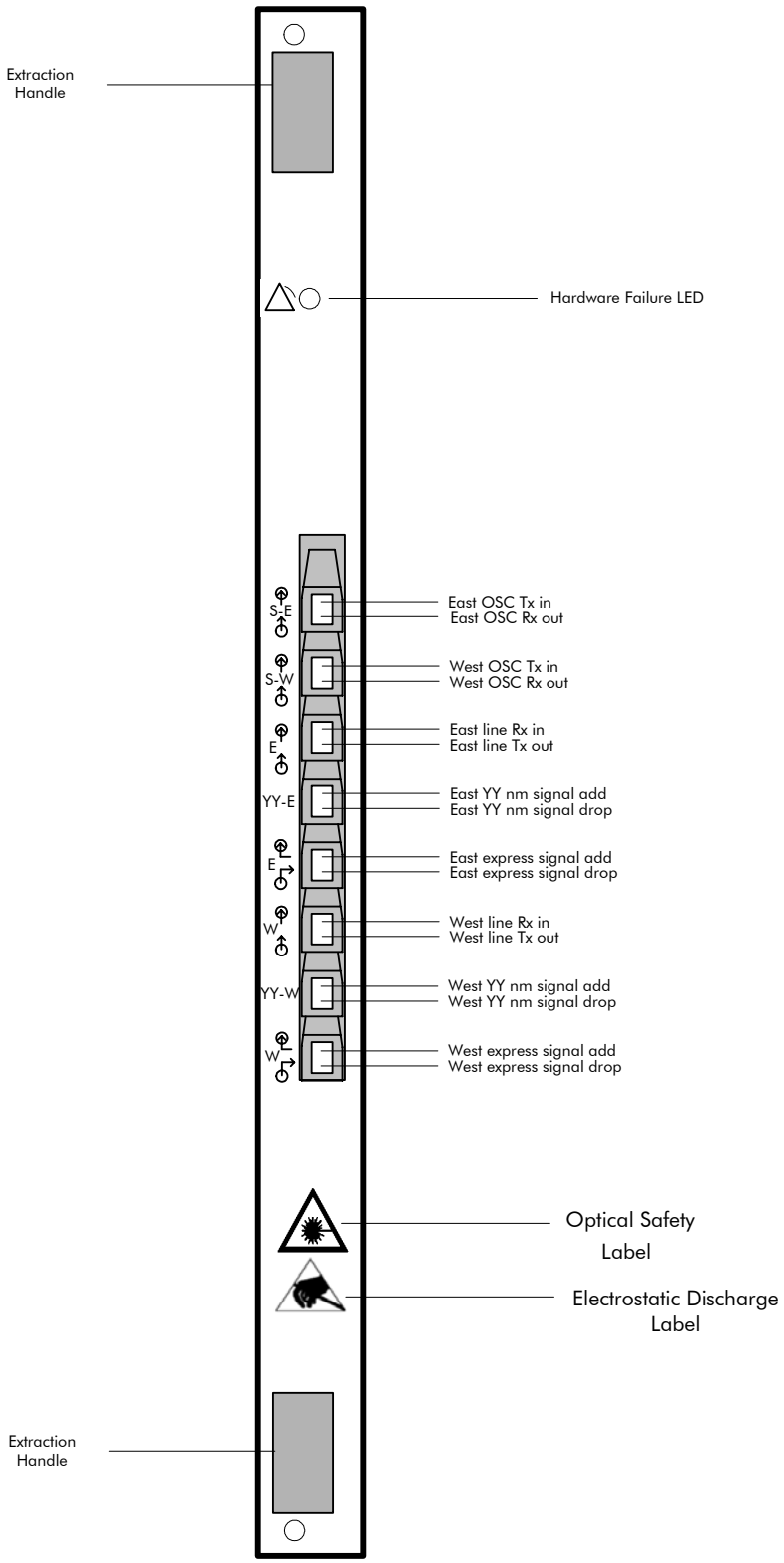

Figure60. Front panel of C-OAD-E-U-1-XX-S board

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3.3.1.3 Optical characteristics

Table 39.C-OAD-E-U-1-XX-S optical characteristics

Insertion Losses	Value	Unit
IN->Exp Ch OUT (Max)	1.3	dB
Exp Ch IN->OUT (Max)	1.3	dB
IN->DROP (Max)	1.5	dB
ADD->OUT (Max)	1.5	dB
IN->OSC DROP (Max)	1	dB
OSC ADD->OUT (Max)	1	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.3.1.4 Front panel wiring

Table 40.Front panel wiring of C-OAD-E-U-1-XX-S board

Name	Signal
East OSC Tx in	East Supervision transmission input signal (from OSC board)
East OSC Rx out	East Supervision reception output signal (to OSC board)
West OSC Tx in	West Supervision transmission input signal (from OSC board)
West OSC Rx out	West Supervision reception output signal (to OSC board)
East Line Rx in	East Line Reception input signal (from line)
East Line Tx out	East Line Transmission output signal (to line)
East YY nm signal add	East YY nm signal add (from corresponding transponder)
East YY nm signal drop	East YY nm signal drop (to corresponding transponder)
East express signal add	East express signal add (from East express signal drop)
East express signal drop	East express signal drop
West Line Rx in	West Line Reception input signal (from line)
West Line Tx out	West Line Transmission output signal (to line)
West YY nm signal add	West YY nm signal add (from corresponding transponder)
West YY nm signal drop	West YY nm signal drop (to corresponding transponder)
West express signal add	West express signal add (from West express signal drop)
West express signal drop	West express signal drop

N.B. YY is one of the CWDM wavelengths (1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610).

N.B. "East" means from west to east, while "West" means from east to west.

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3.3.2 C-OAD-U-1-XX

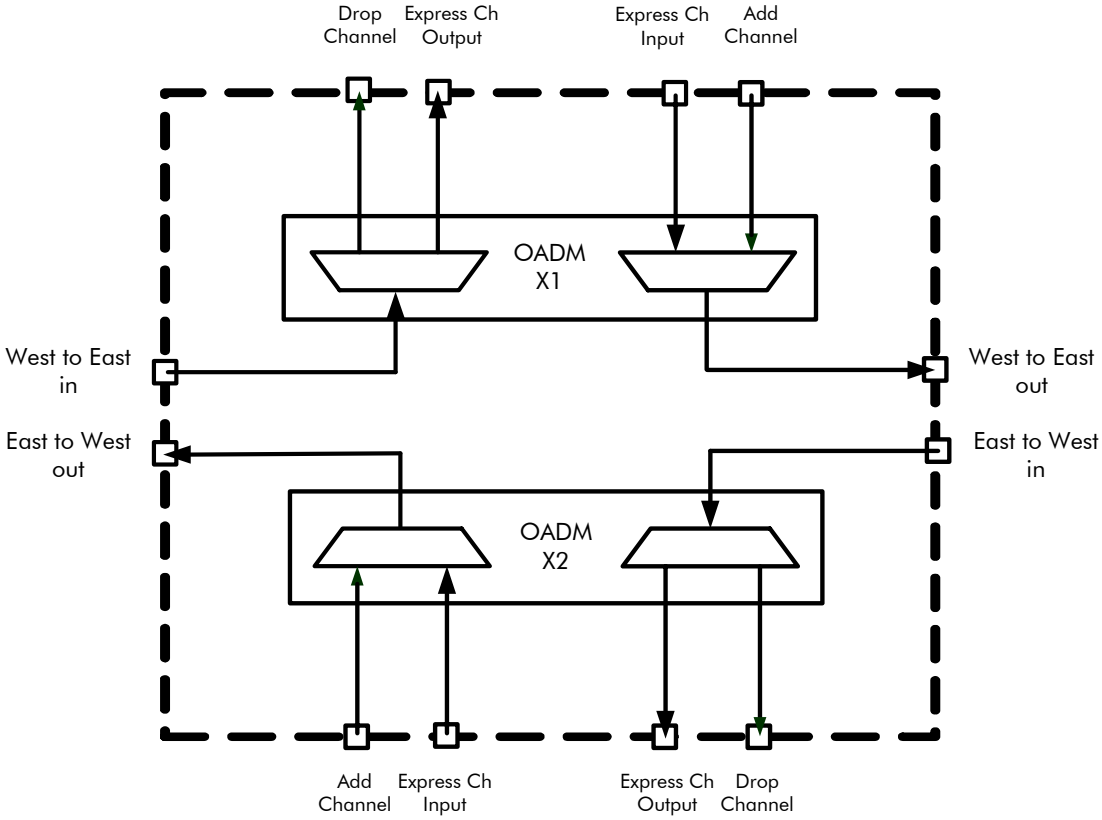

Figure61. C-OAD-U-1-XX block diagram

3.3.2.1 Description

This board (C-OAD-U-1-XX) is used to add and drop **ONE Channel** per direction in the unidirectional CWDM system, and the added/dropped channel is from/to the transponder board. The other channels are passed through the C-OAD board. The OSC 1310nm signal is **NOT** added and dropped by this board.

All channels can be added and dropped. There are 8 different 1-channel C-OAD boards according to the different wavelengths; the wavelengths are defined the same as in Table 38. There are two OADM modules (one OADM module for each direction) in the C-OAD board.

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3.3.2.2 Front panel description

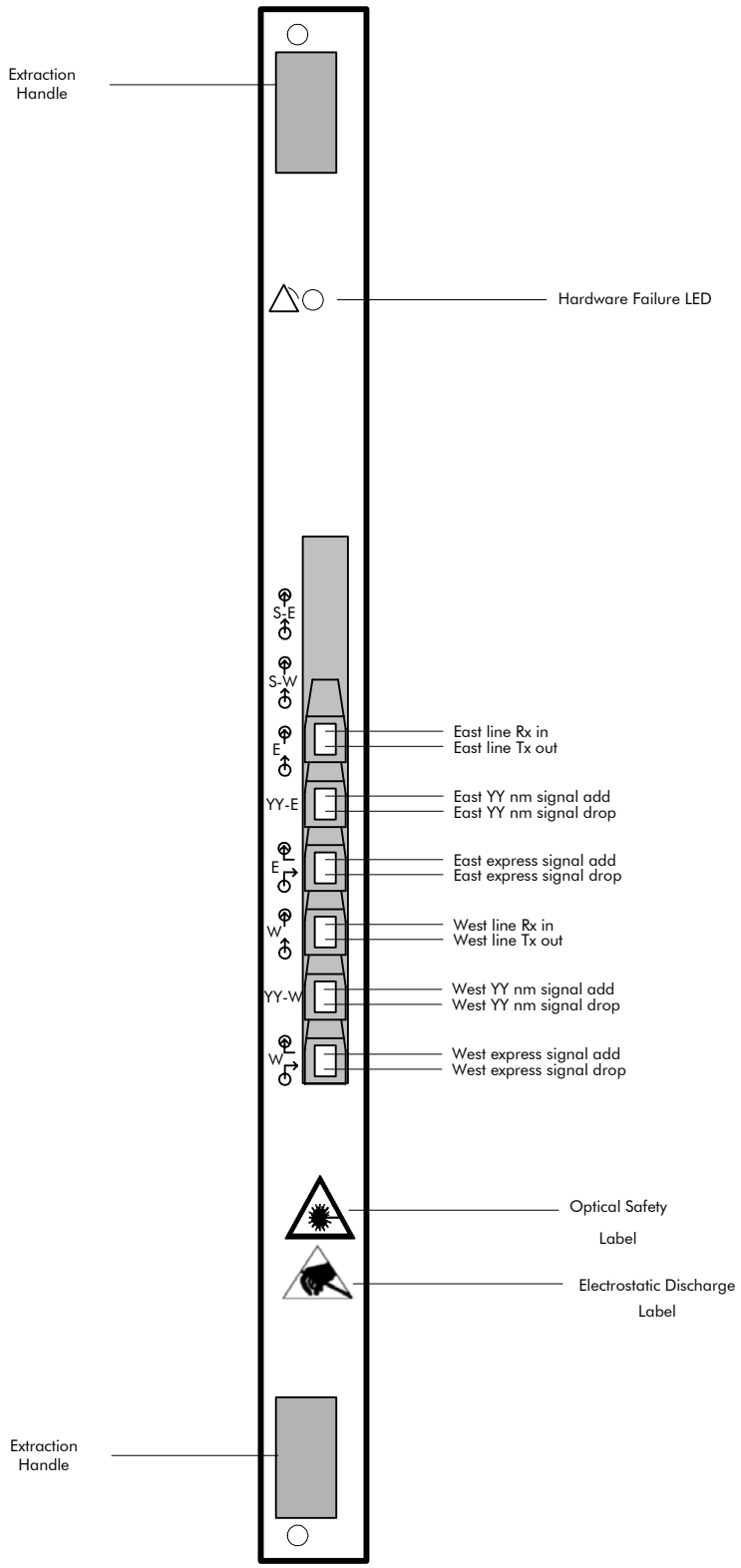

Figure62. Front panel of C-OAD-U-1-XX board

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3.3.2.3 Optical characteristics

Table 41.C-OAD-U-1-XX optical characteristics

Insertion Losses	Value	Unit
IN->Exp Ch OUT (Max)	0.8	dB
Exp Ch IN->OUT (Max)	0.8	dB
IN->DROP (Max)	1	dB
ADD->OUT (Max)	1	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.3.2.4 Front panel wiring

Table 42.Front panel wiring of C-OAD-U-1-XX board

Name	Signal
East Line Rx in	East Line Reception input signal (from line)
East Line Tx out	East Line Transmission output signal (to line)
East YY nm signal add	East YY nm signal add (from corresponding transponder)
East YY nm signal drop	East YY nm signal drop (to corresponding transponder)
East express signal add	East express signal add (from East express signal drop)
East express signal drop	East express signal drop
West Line Rx in	West Line Reception input signal (from line)
West Line Tx out	West Line Transmission output signal (to line)
West YY nm signal add	West YY nm signal add (from corresponding transponder)
West YY nm signal drop	West YY nm signal drop (to corresponding transponder)
West express signal add	West express signal add (from West express signal drop)
West express signal drop	West express signal drop

N.B. YY is one of the CWDM wavelengths (1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610).

N.B. "East" means from west to east, while "West" means from east to west.

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3.3.3 C-OAD-E-U-2-XXXX-S

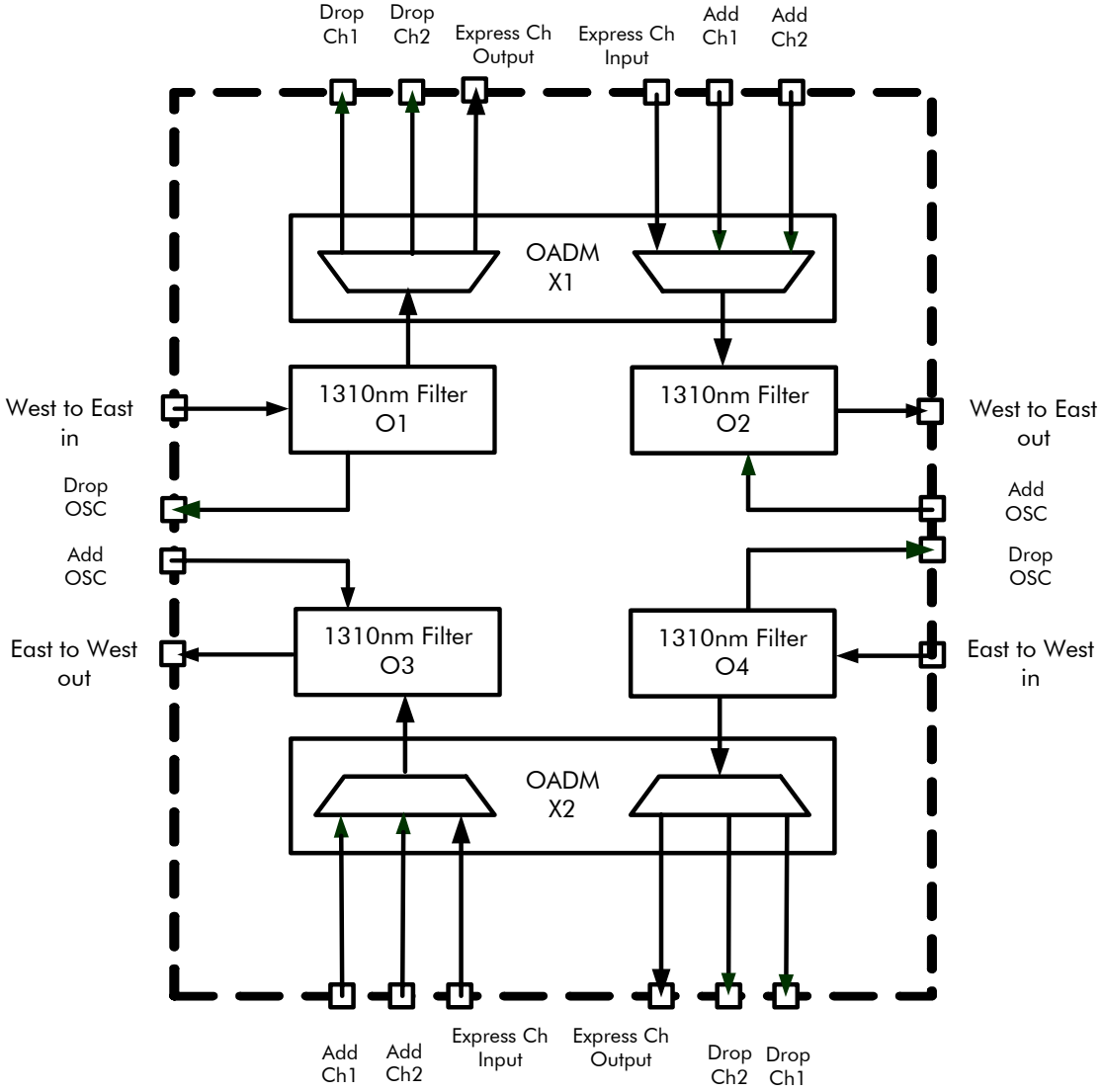

Figure63. C-OAD-E-U-2-XXXX-S block diagram

3.3.3.1 Description

This board (C-OAD-E-U-2-XXXX-S) is used to add and drop **TWO Channels** per direction in the unidirectional CWDM system and the added/dropped channels are to/from the transponder board. The other channels are passed through the C-OAD board.

The OSC 1310nm signal is also added/dropped by this board. The dropped OSC signal is sent to the OSC board; the added OSC signal comes from the OSC board.

There are 4 types of 2-channel C-OAD boards. The wavelengths are defined as in the following table. There are two OADM modules (one OADM modules for each direction) in the C-OAD board.

Table 43.2-channel C-OAD modules for unidirectional applications

Number (XX)	47474949	51515353	55555757	59596161
Add/Drop Channels (nm)	1470,1490	1510,1530	1550,1570	1590,1610

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3.3.3.2 Front panel description

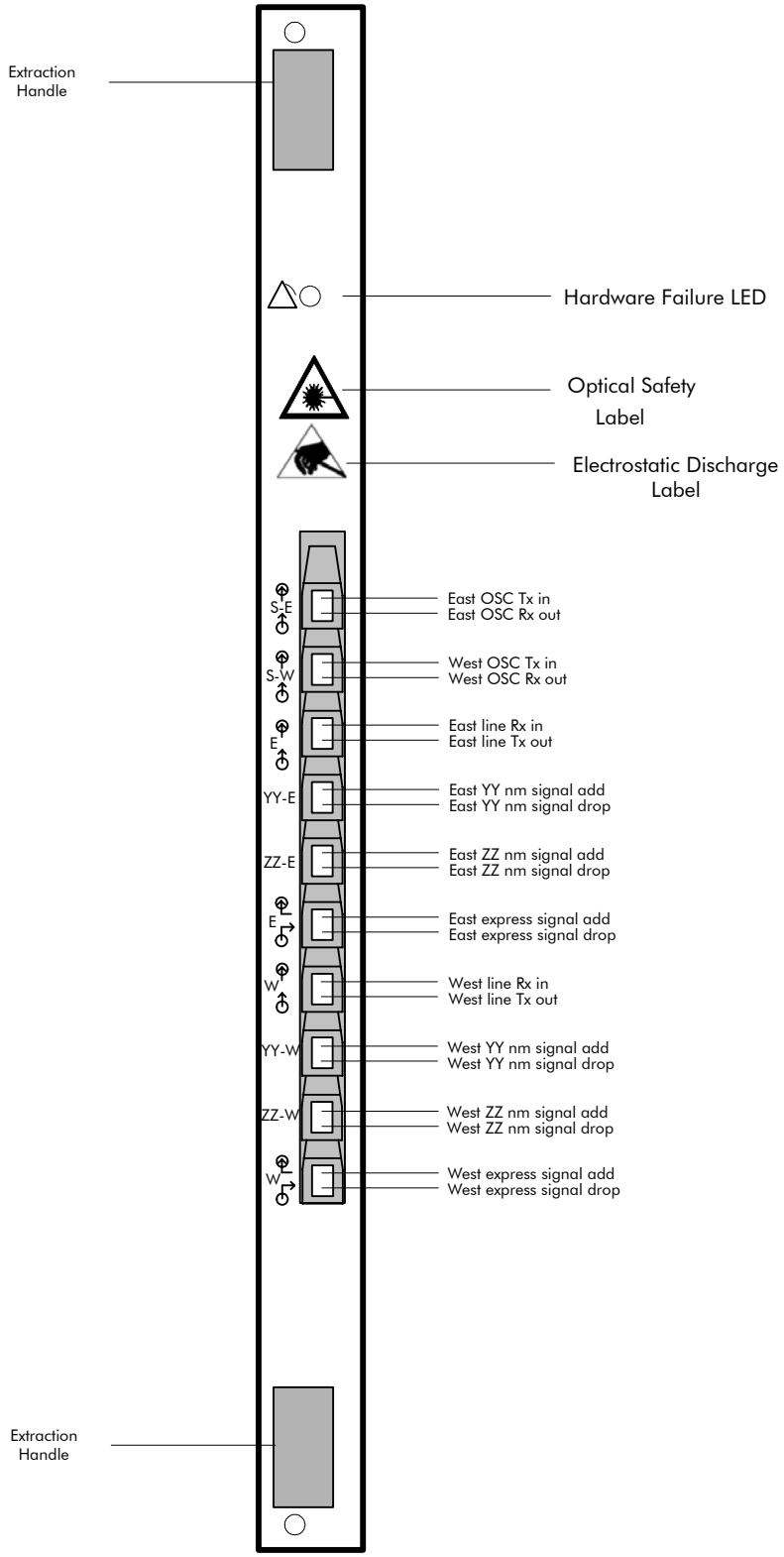

Figure64. Front panel of C-OAD-E-U-2-XXXX-S board

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3.3.3.3 Optical characteristics

Table 44.C-OAD-E-U-2-XXXX-S optical characteristics

Insertion Losses	Value	Unit
IN->Exp Ch OUT (Max)	1.5	dB
Exp Ch IN->OUT (Max)	1.5	dB
IN->DROP (Max)	1.8	dB
ADD->OUT (Max)	1.8	dB
IN->OSC DROP (Max)	1	dB
OSC ADD->OUT (Max)	1	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.3.3.4 Front panel wiring

Table 45.Front panel wiring of C-OAD-E-U-2-XXXX-S board

Name	Signal
East OSC Tx in	East Supervision transmission input signal (from OSC board)
East OSC Rx out	East Supervision reception output signal (to OSC board)
West OSC Tx in	West Supervision transmission input signal (from OSC board)
West OSC Rx out	West Supervision reception output signal (to OSC board)
East Line Rx in	East Line Reception input signal (from line)
East Line Tx out	East Line Transmission output signal (to line)
East YY nm signal add	East YY nm signal add (from corresponding transponder)
East YY nm signal drop	East YY nm signal drop (to corresponding transponder)
East ZZ nm signal add	East ZZ nm signal add (from corresponding transponder)
East ZZ nm signal drop	East ZZ nm signal drop (to corresponding transponder)
East express signal add	East express signal add (from East express signal drop)
East express signal drop	East express signal drop
West Line Rx in	West Line Reception input signal (from line)
West Line Tx out	West Line Transmission output signal (to line)
West YY nm signal add	West YY nm signal add (from corresponding transponder)
West YY nm signal drop	West YY nm signal drop (to corresponding transponder)
West ZZ nm signal add	West ZZ nm signal add (from corresponding transponder)
West ZZ nm signal drop	West ZZ nm signal drop (to corresponding transponder)
West express signal add	West express signal add (from West express signal drop)
West express signal drop	West express signal drop

N.B. (YY, ZZ) is one of the CWDM wavelengths combinations [(1470, 1490), (1510, 1530), (1550, 1570), (1590, 1610)].

N.B. "East" means from west to east, while "West" means from east to west.

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3.3.4 C-OAD-U-2-XXXX

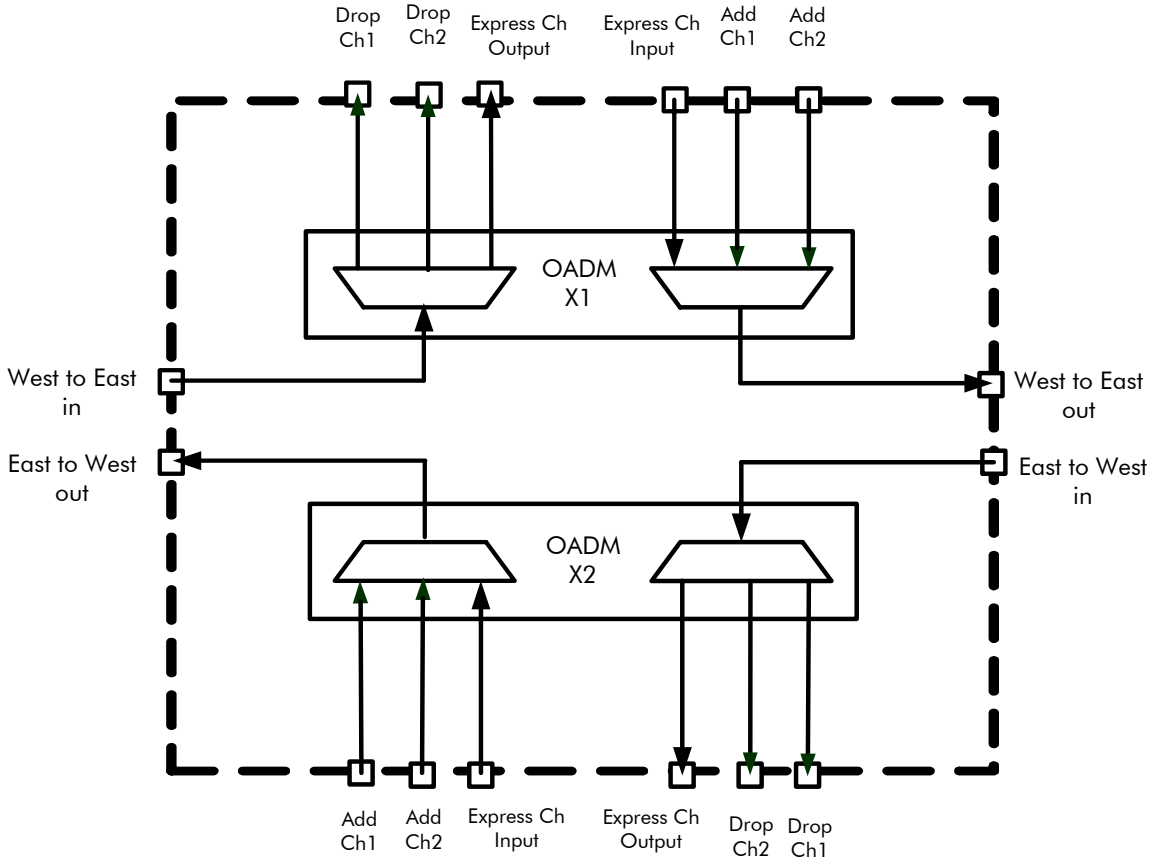

Figure65. C-OAD-U-2-XXXX block diagram

3.3.4.1 Description

This board (C-OAD-U-2-XX) is used to add and drop **TWO Channels** per direction in the unidirectional CWDM system and the added/dropped channels are to/from the transponder board. The other channels are passed through the C-OAD board.

The OSC 1310nm signal is NOT added/dropped by this board. There are 4 types of 2-channel C-OAD boards, the wavelengths are defined the same as in Table 43. There are two OADM modules (one OADM modules for each direction) in the C-OAD board.

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3.3.4.2 Front panel description

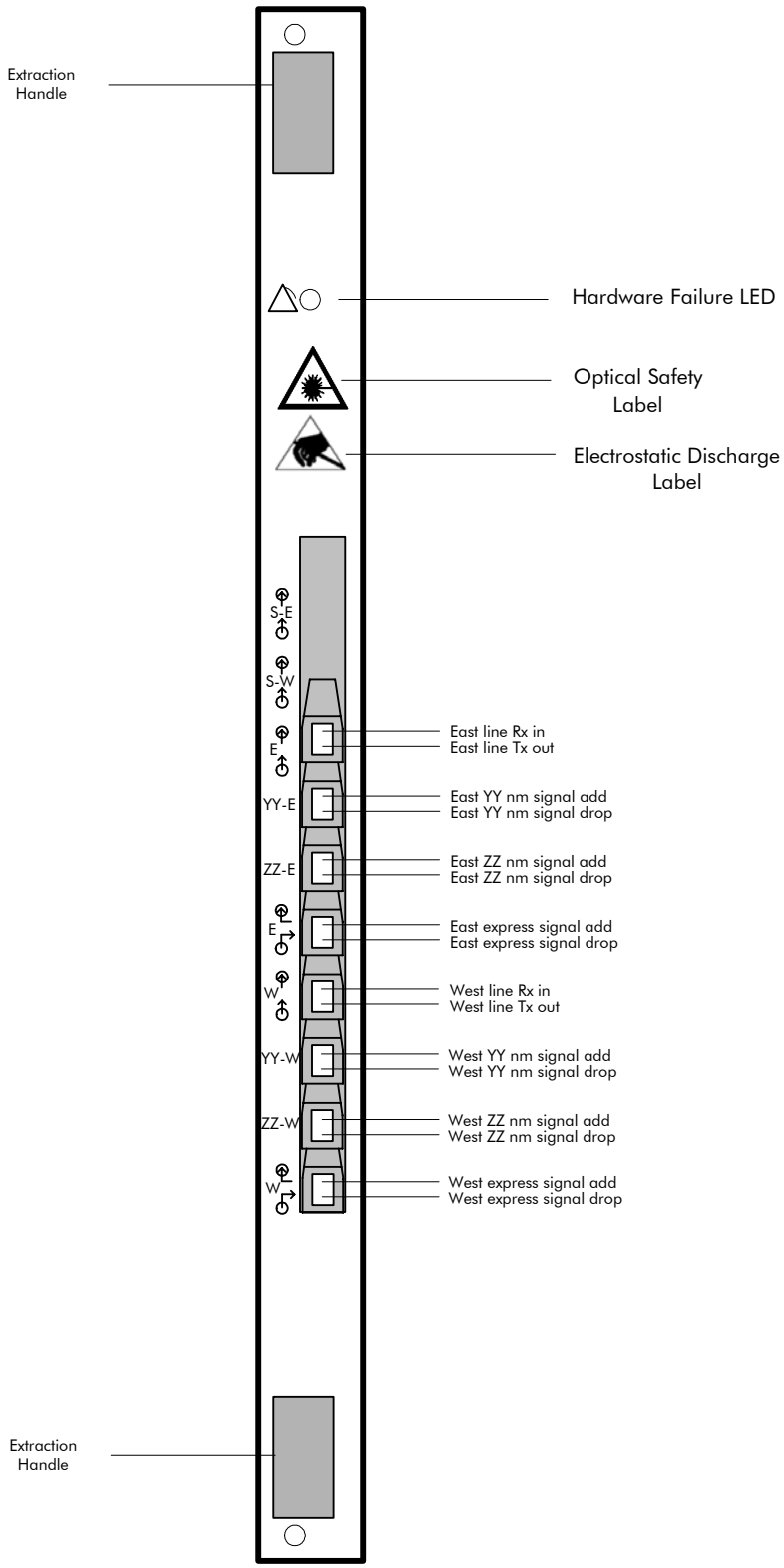

Figure66. Front panel of C-OAD-U-2-XXXX board

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3.3.4.3 Optical characteristics

Table 46.C-OAD-U-2-XXXX optical characteristics

Insertion Losses	Value	Unit
IN↔Exp Ch OUT (Max)	1.0	dB
Exp Ch IN↔ OUT (Max)	1.0	dB
IN->DROP (Max)	1.3	dB
ADD->OUT (Max)	1.3	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.3.4.4 Front panel wiring

Table 47.Front panel wiring of C-OAD-U-2-XXXX board

Name	Signal
East Line Rx in	East Line Reception input signal (from line)
East Line Tx out	East Line Transmission output signal (to line)
East YY nm signal add	East YY nm signal add (from corresponding transponder)
East YY nm signal drop	East YY nm signal drop (to corresponding transponder)
East ZZ nm signal add	East ZZ nm signal add (from corresponding transponder)
East ZZ nm signal drop	East ZZ nm signal drop (to corresponding transponder)
East express signal add	East express signal add (from East express signal drop)
East express signal drop	East express signal drop
West Line Rx in	West Line Reception input signal (from line)
West Line Tx out	West Line Transmission output signal (to line)
West YY nm signal add	West YY nm signal add (from corresponding transponder)
West YY nm signal drop	West YY nm signal drop (to corresponding transponder)
West ZZ nm signal add	West ZZ nm signal add (from corresponding transponder)
West ZZ nm signal drop	West ZZ nm signal drop (to corresponding transponder)
West express signal add	West express signal add (from West express signal drop)
West express signal drop	West express signal drop

N.B. (YY, ZZ) is one of the CWDM wavelengths combinations [(1470, 1490), (1510, 1530), (1550, 1570), (1590, 1610)].

N.B. "East" means from west to east, while "West" means from east to west.

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3.3.5 C-OAD-B-1-XX-S

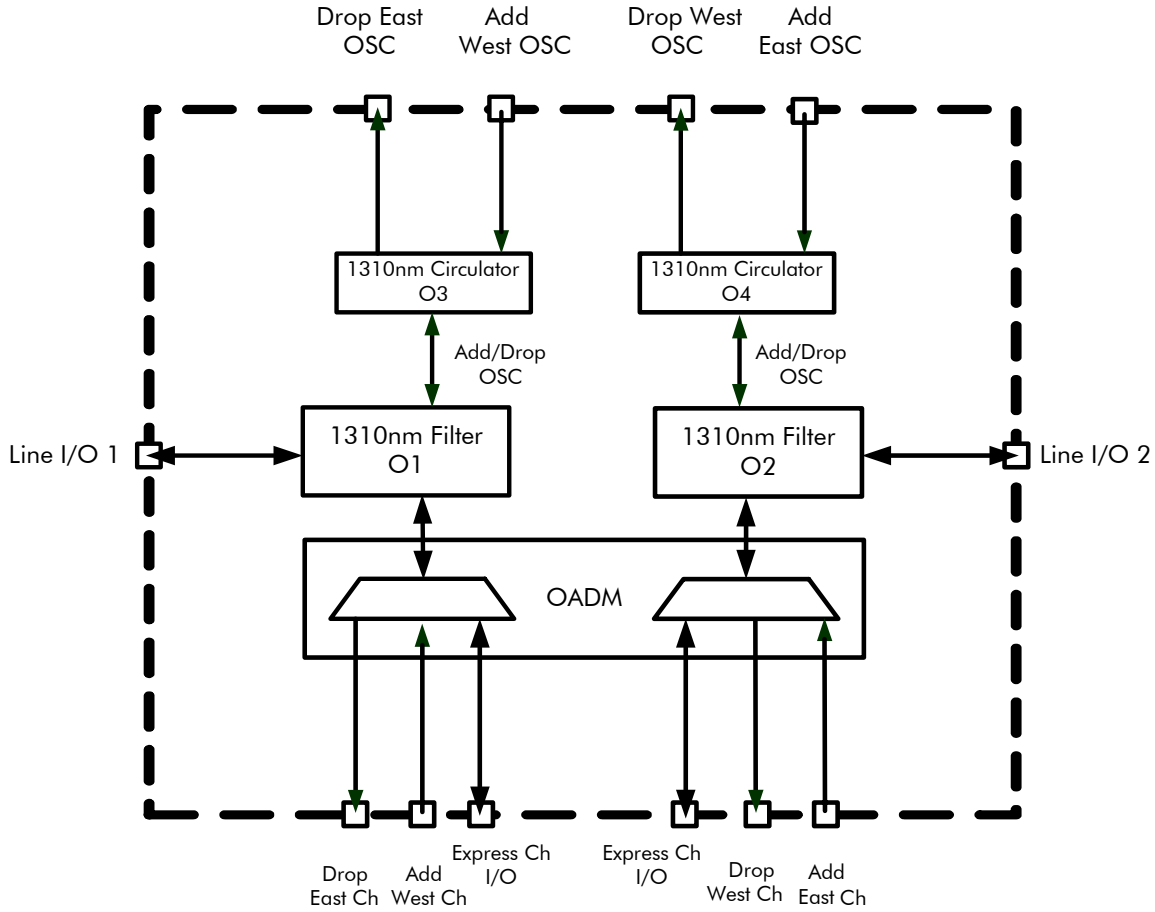

Figure67. C-OAD-B-1-XX-S block diagram

3.3.5.1 Description

This board (C-OAD-B-1-XX-S) is used to add and drop only **ONE channel** per direction in the Bidirectional CWDM system. A west added/dropped channel is to/from a transponder board and an east added/dropped channel is to/from a transponder board. The other channels are passed through the C-OAD board.

The OSC 1310nm signals (including east and west directions) are also added and dropped by this board. The east/west added OSC signals come from the east/west OSC modules and the east/west dropped OSC signals are sent to the east/west OSC modules.

There are 4 types of Bidirectional C-OAD boards. The wavelengths are defined as in the following table.

There is only one 2-channel C-OAD module (one add & drop channel for each direction) in the board.

Table 48.C-OAD modules for bidirectional application

Number (XX)	4755	4957	5159	5361
Add/Drop Channels (nm)	1470,1550	1490,1570	1510,1590	1530,1610

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3.3.5.2 Front panel description

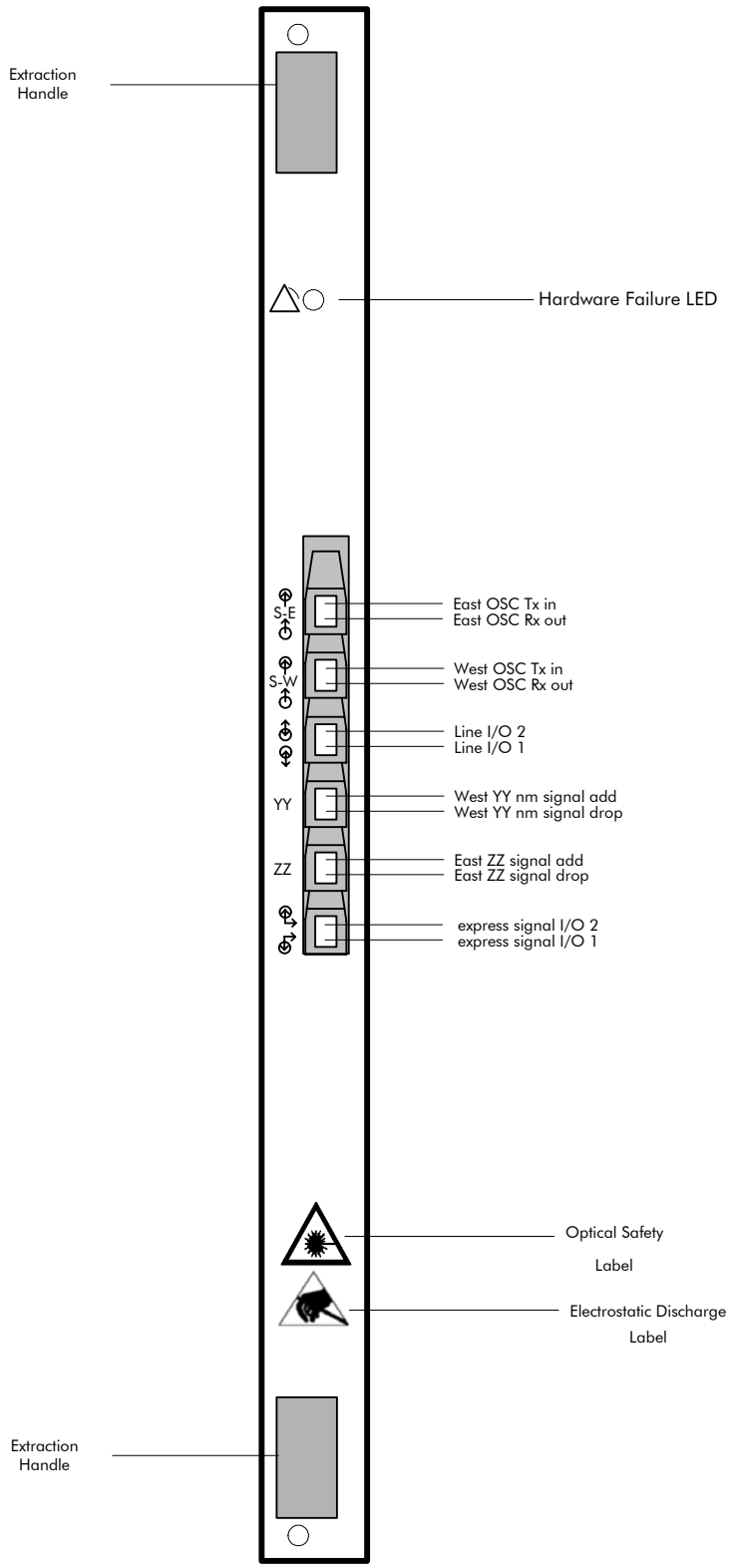

Figure68. Front panel of C-OAD-B-1-XX-S board

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3.3.5.3 Optical characteristics

Table 49.C-OAD-B-1-XX-S optical characteristics

Insertion Losses	**Value**	**Unit**
I/O<->Exp Ch I/O (Max)	1.5	dB
I/O->DROP (Max)	1.8	dB
ADD->I/O (Max)	1.8	dB
Insertion loss (I/O->OSC Drop, OSC Add->I/O)(Max)	2	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.3.5.4 Front panel wiring

Table 50.Front panel wiring of C-OAD-B-1-XX-S board

Name	**Signal**
East OSC Tx in	East Supervision transmission input signal (from OSC board)
East OSC Rx out	East Supervision reception output signal (to OSC board)
West OSC Tx in	West Supervision transmission input signal (from OSC board)
West OSC Rx out	West Supervision reception output signal (to OSC board)
Line I/O 2	Line signal 2 (from/to line)
Line I/O 1	Line signal 1 (from/to line)
West YY nm signal add	West YY nm signal add (from corresponding transponder)
West YY nm signal drop	West YY nm signal drop (to corresponding transponder)
East ZZ nm signal add	East ZZ nm signal add (from corresponding transponder)
East ZZ nm signal drop	East ZZ nm signal drop (to corresponding transponder)
Express signal I/O 2	Express signal I/O 2 add/drop (connected with express signal I/O 1)
Express signal I/O 1	Express signal I/O 1 add/drop

N.B. (YY, ZZ) is one of the CWDM wavelengths combinations [(1470, 1550), (1490, 1570), (1510, 1590), (1530, 1610)].

N.B. "East" means from west to east, while "West" means from east to west.

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3.3.6 C-OAD-B-1-XX

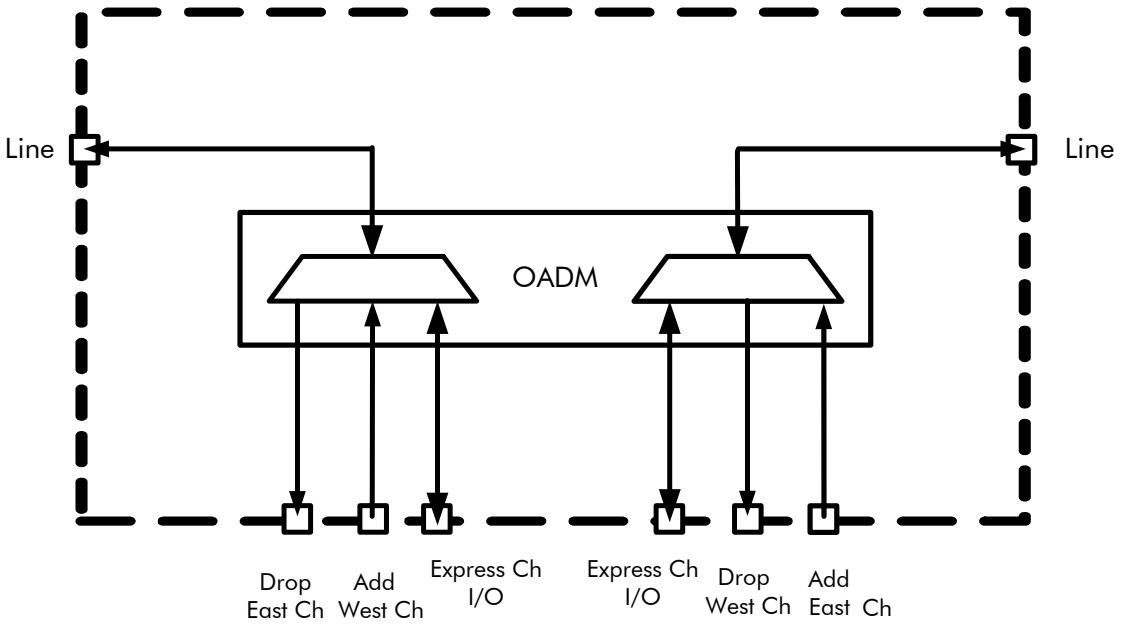

Figure69. C-OAD-B-1-XX block diagram

3.3.6.1 Description

This board (C-OAD-B-1-XX) is used to add and drop only **ONE channel** per direction in the Bidirectional CWDM system. A west added/dropped channel is to/from a transponder board and an east added/dropped channel is to/from a transponder board. The other channels are passed through the C-OAD board.

The OSC 1310nm signal is NOT added and dropped by this board.

There are 4 types of Bidirectional C-OAD boards; the wavelengths are defined the same as in Table 48.

There is only one 2-channel C-OAD module (one add & drop channel for each direction) in the board.

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3.3.6.2 Front panel description

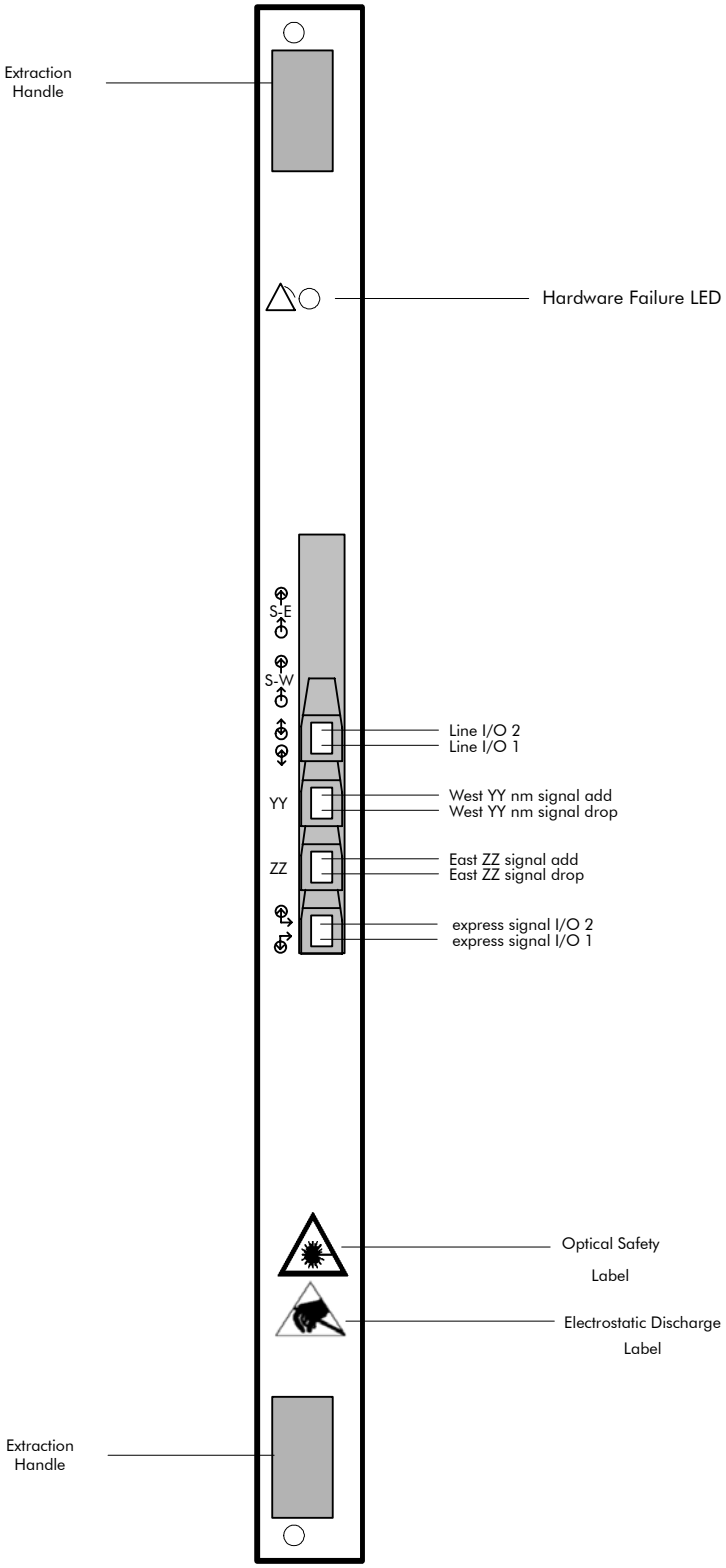

Figure70. Front panel of C-OAD-B-1-XX board

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3.3.6.3 Optical characteristics

Table 51.C-OAD-B-1-XX optical characteristics

Insertion Losses	**Value**	**Unit**
IN<->Exp Ch OUT (Max)	1	dB
IN->DROP (Max)	1.3	dB
ADD->OUT (Max)	1.3	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

3.3.6.4 Front panel wiring

Table 52.Front panel wiring of C-OAD-B-1-XX board

Name	**Signal**
Line I/O 2	Line signal 2 (from/to line)
Line I/O 1	Line signal 1 (from/to line)
West YY nm signal add	West YY nm signal add (from corresponding transponder)
West YY nm signal drop	West YY nm signal drop (to corresponding transponder)
East ZZ nm signal add	East ZZ nm signal add (from corresponding transponder)
East ZZ nm signal drop	East ZZ nm signal drop (to corresponding transponder)
Express signal I/O 2	Express signal I/O 2 add/drop (connected with express signal I/O 1)
Express signal I/O 1	Express signal I/O 1 add/drop

N.B. (YY, ZZ) is one of the CWDM wavelengths combinations [(1470, 1550), (1490, 1570), (1510, 1590), (1530, 1610)].

N.B. "East" means from west to east, while "West" means from east to west.

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3.3.7 C-OAD-H-U-4-XXXXXXXX-S

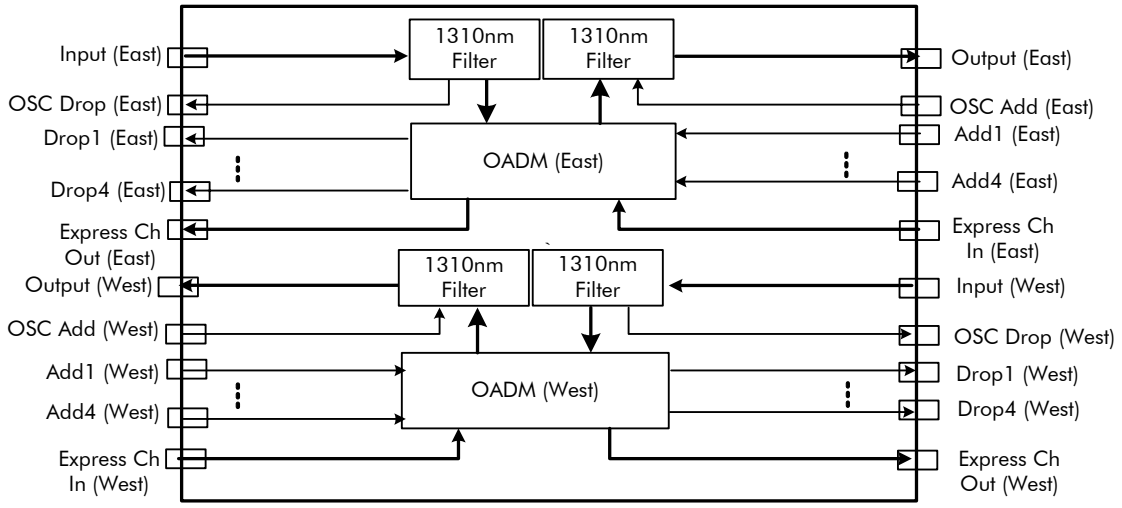

Figure71. C-OAD-H-U-4-XXXXXXXX-S block diagram

3.3.7.1 Description

C-OAD-H-U-4-XXXXXXXX-S board is designed for 4ch OADM application, which can add/drop 4ch CWDM channels for 2 directions. 1310nm signal can be inserted/extracted with this board, which can be used for 1310nm legacy service transmission.

The operating temperature range is from -40 to +85 degree C.

The C-OAD-H-U-4-XXXXXXXX-S unit's add & drop channels sequence is defined by the following table:

Table 53.Add & drop channels sequence

Add & Drop Wavelength (nm)		**Channel Number**
C-OAD-H-U-4-47495153-S	C-OAD-H-U-4-55575961-S	
1470	1550	1
1490	1570	2
1510	1590	3
1530	1610	4

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3.3.7.2 Front panel description

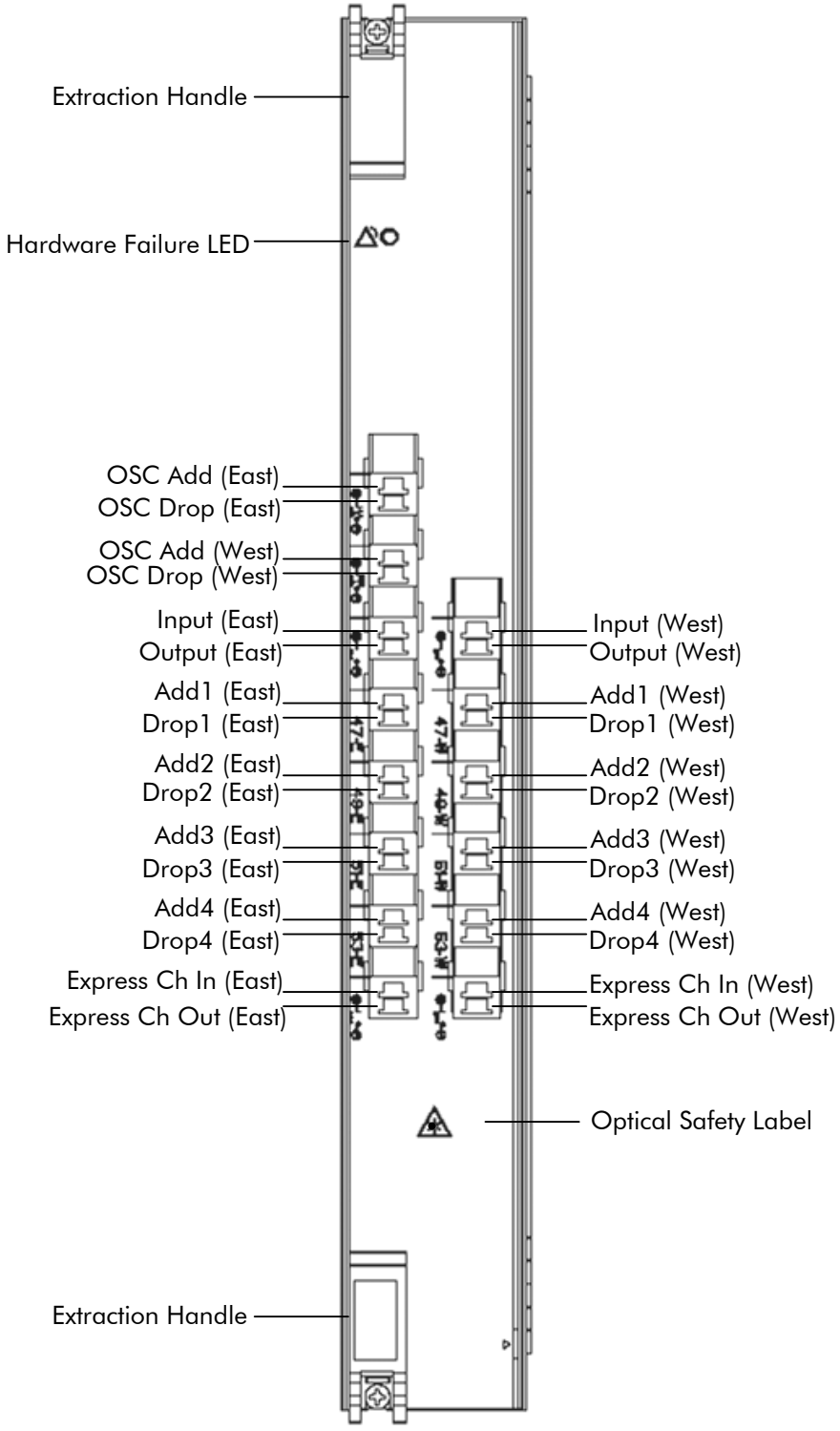

Figure72. Front panel of C-OAD-H-U-4-XXXXXXXX-S

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3.3.7.3 Optical characteristics

Table 54.C-OAD-H-U-4-XXXXXXXX-S optical characteristics

	From/To	Ch1 Drop West&East	Ch2 Drop West&East	Ch3 Drop West&East	Ch4 Drop West&East	1310nmOut West&East	West&East Out	Express Out West&East
Insertion Loss (dB)	Ch1 Add West&East	-	-	-	-	-	1.6	-
	Ch2 Add West&East	-	-	-	-	-	1.9	-
	Ch3 Add West&East	-	-	-	-	-	2.2	-
	Ch4 Add West&East	-	-	-	-	-	2.5	-
	1310nm IN West&East	-	-	-	-	-	1.0	-
	West&East IN	2.5	2.2	1.9	1.6	1.0	-	2.4
	Express In West&East	-	-	-	-	-	2.4	-
Pass Band@-0.5dB		(X-7nm, X+7nm), X=G.694.2 8ch Grids						
Adjacent Isolation (dB)		>=40						
Non-Adjacent Isolation (dB)		>=45						
Express Isolation (dB)		>=15						
Optical Interface		MU/SPC						

3.3.7.4 Front view and port identification

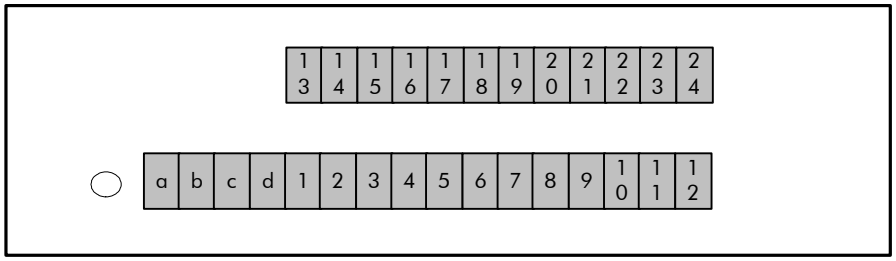

Figure73. Front panel ports of C-OAD-H-U-4-XXXXXXXX-S

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Table 55.Optical ports allocation of C-OAD-H-U-4-XXXXXXXX-S

#	I/O	Function	Connectors	Front/Back
a	I	1310nm Add (East)	MU/SPC	Front
b	O	1310nm Drop (East)	MU/SPC	Front
c	I	1310nm Add (West)	MU/SPC	Front
d	O	1310nm Drop (West)	MU/SPC	Front
1	I	Input (East)	MU/SPC	Front
2	O	Output (East)	MU/SPC	Front
3	I	Add1 (East)	MU/SPC	Front
4	O	Drop1 (East)	MU/SPC	Front
5	I	Add2 (East)	MU/SPC	Front
6	O	Drop2 (East)	MU/SPC	Front
7	I	Add3 (East)	MU/SPC	Front
8	O	Drop3 (East)	MU/SPC	Front
9	I	Add4 (East)	MU/SPC	Front
10	O	Drop4 (East)	MU/SPC	Front
11	I	Express Ch In (East)	MU/SPC	Front
12	O	Express Ch Out (East)	MU/SPC	Front
13	I	Input (West)	MU/SPC	Front
14	O	Output (West)	MU/SPC	Front
15	I	Add1 (West)	MU/SPC	Front
16	O	Drop1 (West)	MU/SPC	Front
17	I	Add2 (West)	MU/SPC	Front
18	O	Drop2 (West)	MU/SPC	Front
19	I	Add3 (West)	MU/SPC	Front
20	O	Drop3 (West)	MU/SPC	Front
21	I	Add4 (West)	MU/SPC	Front
22	O	Drop4 (West)	MU/SPC	Front
23	I	Express Ch In (West)	MU/SPC	Front
24	O	Express Ch Out (West)	MU/SPC	Front

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3.4 OADM2 units (C-OAD2)

The following C-OAD2 boards are used:

- Unidirectional 1 Add & Drop C-OAD2 with 1310nm filter: C-OAD2-E-U-1-XX-S
- Unidirectional 1 Add & Drop C-OAD2 without 1310nm filter: C-OAD2-U-1-XX
- Unidirectional 2 Add & Drop C-OAD2 with 1310nm filter: C-OAD2-E-U-2-XXXX-S
- Unidirectional 2 Add & Drop C-OAD2 without 1310nm filter: C-OAD2-U-2-XXXX
- Unidirectional 4 Add & Drop C-OAD2 with 1310nm filter: C-OAD2-E-U-4-XXXXXXXX-S
- Unidirectional 4 Add & Drop C-OAD2 without 1310nm filter: C-OAD2-U-4-XXXXXXXX

3.4.1 C-OAD2-E-U-1-XX-S

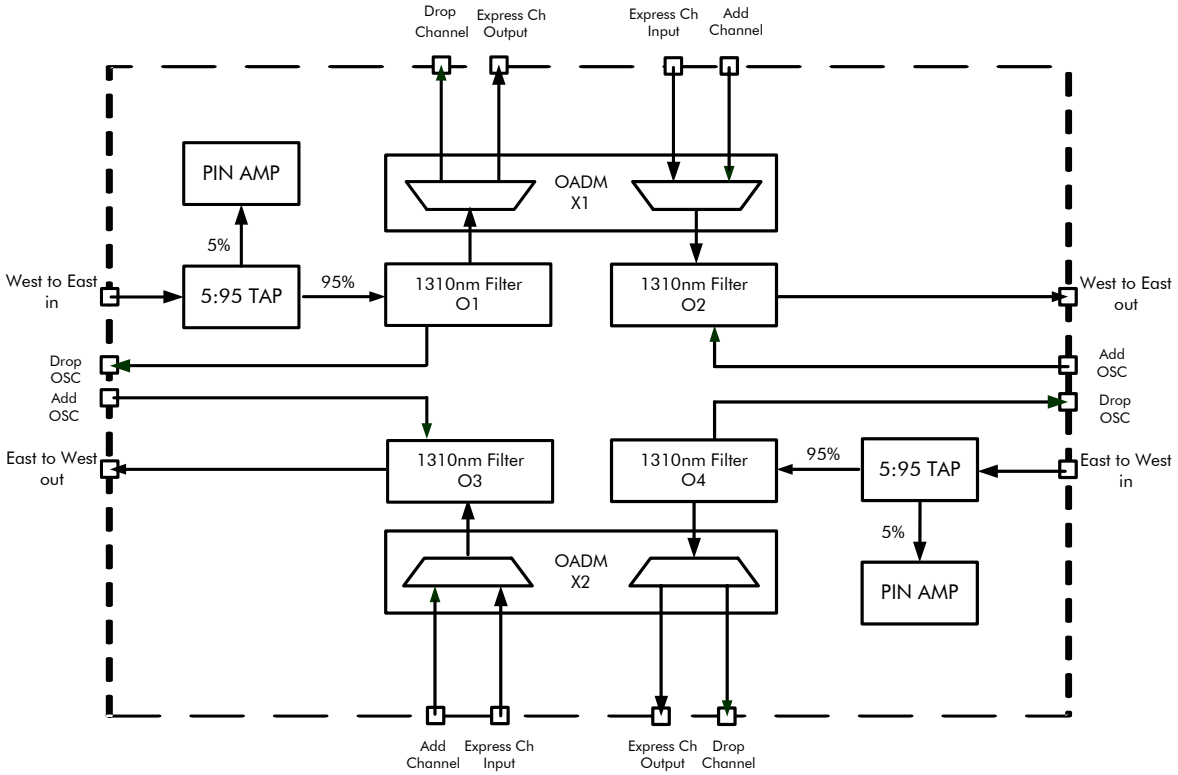

Figure74. C-OAD2-E-U-1-XX-S block diagram

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3.4.1.1 Description

This board (C-OAD2-E-U-1-XX-S) is used to add and drop **ONE Channel** per direction in the unidirectional CWDM system; the added/dropped channel is to/from the transponder board. The other channels are passed through the C-OAD2 board.

The OSC 1310nm signal is also added/dropped by this board. The dropped OSC signal is sent to the OSC board; the added OSC signal comes from the OSC board.

All channels can be added and dropped. There are 8 different 1-channel C-OAD2 boards according to the different wavelengths; the wavelengths are defined as in the following table.

Table 56.1-channel C-OAD2 module for unidirectional application

Number (XX)	4747	4949	5151	5353	5555	5757	5959	6161
Add/Drop Channels (nm)	1470	1490	1510	1530	1550	1570	1590	1610

There are two OADM modules (one OADM module for each direction) in the board.

At each receiving direction, a 5:95 TAP is used to split the line signal into two channels. One (95%) is sent to the 1310nm filter splitter; the other (5%) is sent to a PIN & amplification circuit for LOS detection. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

The front panel and front panel wiring are the same as C-OAD-E-U-1-XX-S unit.

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3.4.2 C-OAD2-U-1-XX

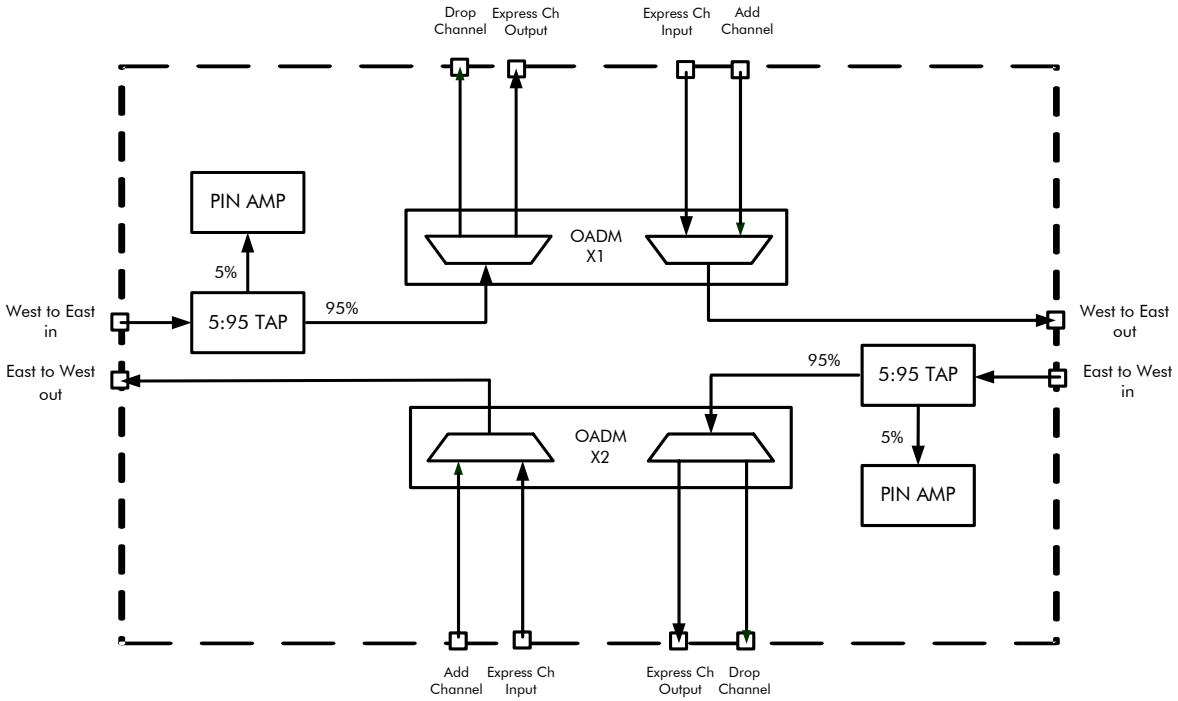

Figure75. C-OAD2-U-1-XX block diagram

3.4.2.1 Description

This board (C-OAD2-U-1-XX) is used to add and drop **ONE Channel** per direction in the unidirectional CWDM system and the added/dropped channel is to/from the transponder board. The other channels are passed through the C-OAD2 board.

The OSC 1310nm signal is **NOT** added and dropped by this board.

All channels can be added and dropped. There are 8 different 1-channel C-OAD2 boards according to the different wavelengths; the wavelengths are defined the same as in Table 56.

There are two OADM modules (one OADM module for each direction) in the C-OAD2 board.

At each receiving direction, a 5:95 TAP is used to split the line signal into two channels. One (95%) is sent to the OADM module; the other (5%) is sent to a PIN & amplification circuit for LOS detection. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

The front panel and front panel wiring are the same as C-OAD-U-1-XX unit.

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3.4.3 C-OAD2-E-U-2-XXXX-S

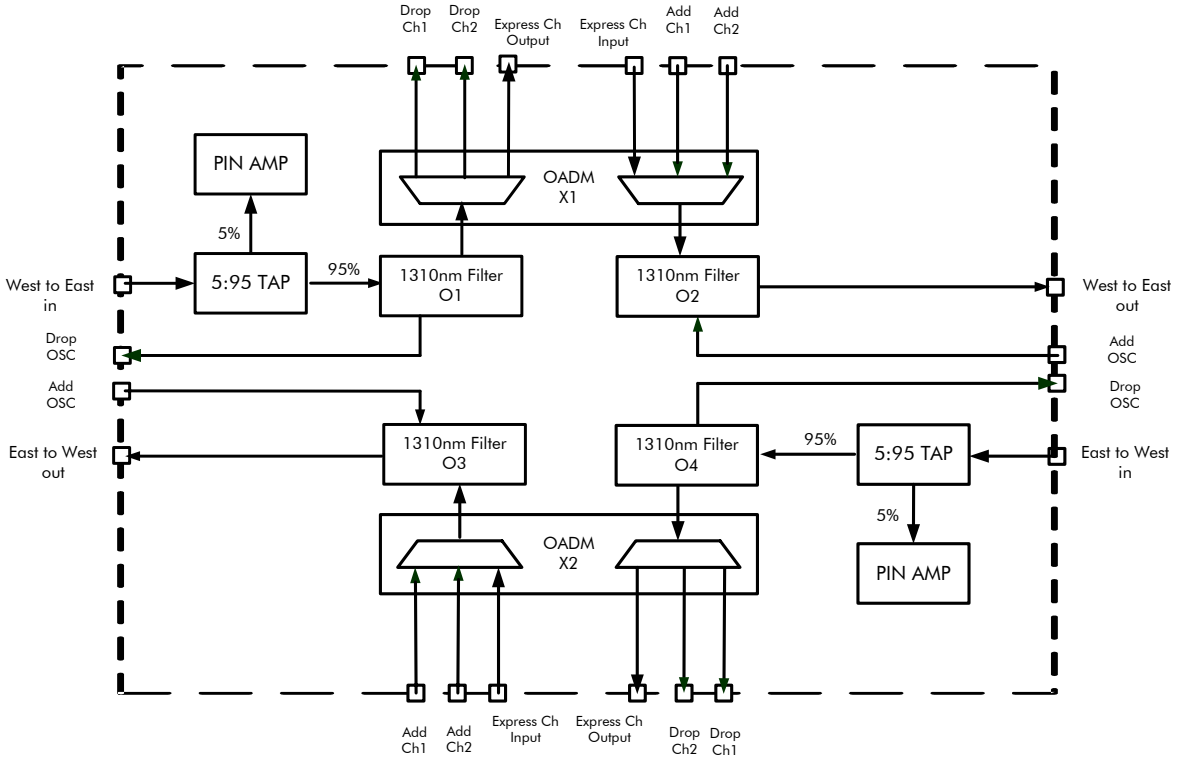

Figure76. C-OAD2-E-U-2-XXXX-S block diagram

3.4.3.1 Description

This board (C-OAD2-E-U-2-XXXX-S) is used to add and drop **TWO Channels** per direction in the unidirectional CWDM system and the added/dropped channels are to/from the transponder board. The other channels are passed through the C-OAD2 board.

The OSC 1310nm signal is also added/dropped by this board. The dropped OSC signal is sent to the OSC board; the added OSC signal comes from the OSC board.

There are 4 types of 2-channel C-OAD2 boards; the wavelengths are defined as the following table.

There are two OADM modules (one OADM modules for each direction) in the C-OAD2 board.

At each receiving direction, a 5:95 TAP is used to split the line signal into two channels. One (95%) is sent to the 1310nm filter splitter; the other (5%) is sent to a PIN & amplification circuit for LOS detection. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

Table 57.2-channel C-OAD2 module for unidirectional application

Number (XX)	47474949	51515353	55555757	59596161
Add/Drop Channels (nm)	1470,1490	1510,1530	1550,1570	1590,1610

The front panel and front panel wiring are the same as in a C-OAD-E-U-2-XXXX-S unit.

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3.4.4 C-OAD2-U-2-XXXX

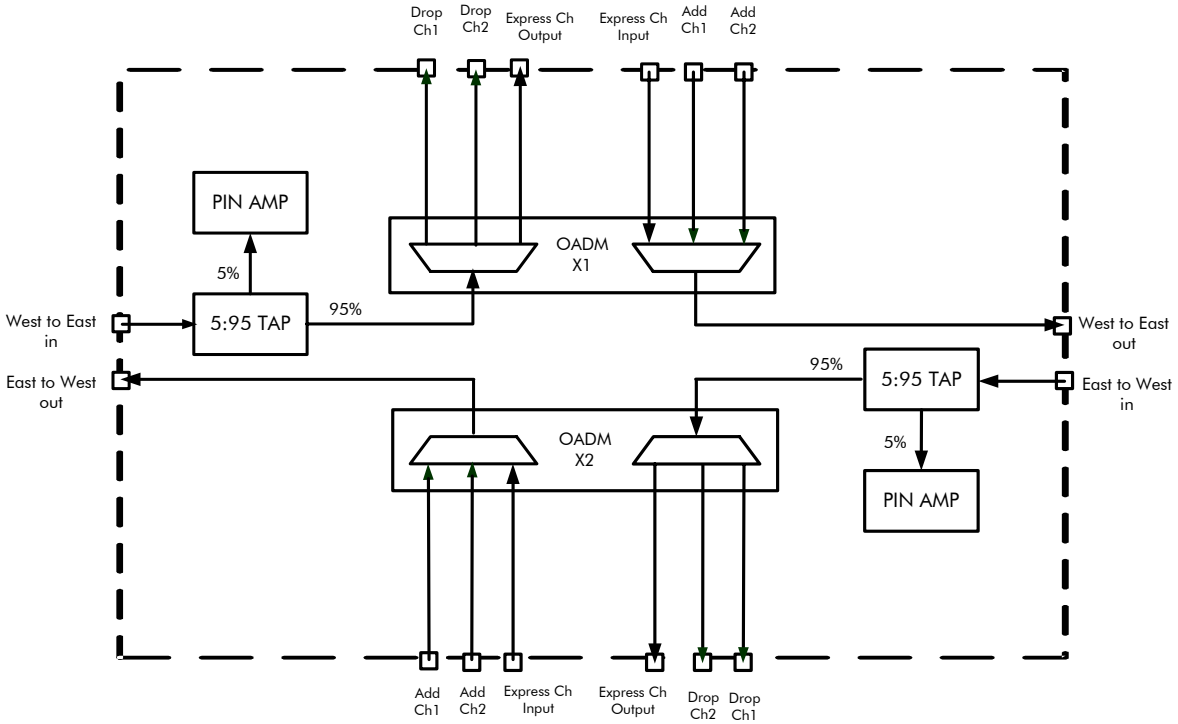

Figure77. C-OAD2-U-2-XXXX block diagram

3.4.4.1 Description

This board (C-OAD2-U-2-XXXX) is used to add and drop **TWO Channels** per direction in the unidirectional CWDM system and the added/dropped channels are to/from the transponder board. The other channels are passed through the C-OAD2 board.

The OSC 1310nm signal is NOT added/dropped by this board.

There are 4 types of 2-channel C-OAD2 boards. The wavelengths are defined the same as in Table 57.

There are two OADM modules (one OADM modules for each direction) in the C-OAD2 board.

At each receiving direction, a 5:95 TAP is used to split the line signal into two channels. One (95%) is sent to the OADM module; the other (5%) is sent to a PIN & amplification circuit for LOS detection. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

The front panel and front panel wiring are the same as in a C-OAD-U-2-XXXX unit.

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3.4.5 C-OAD2-E-U-4-XXXXXXXX-S

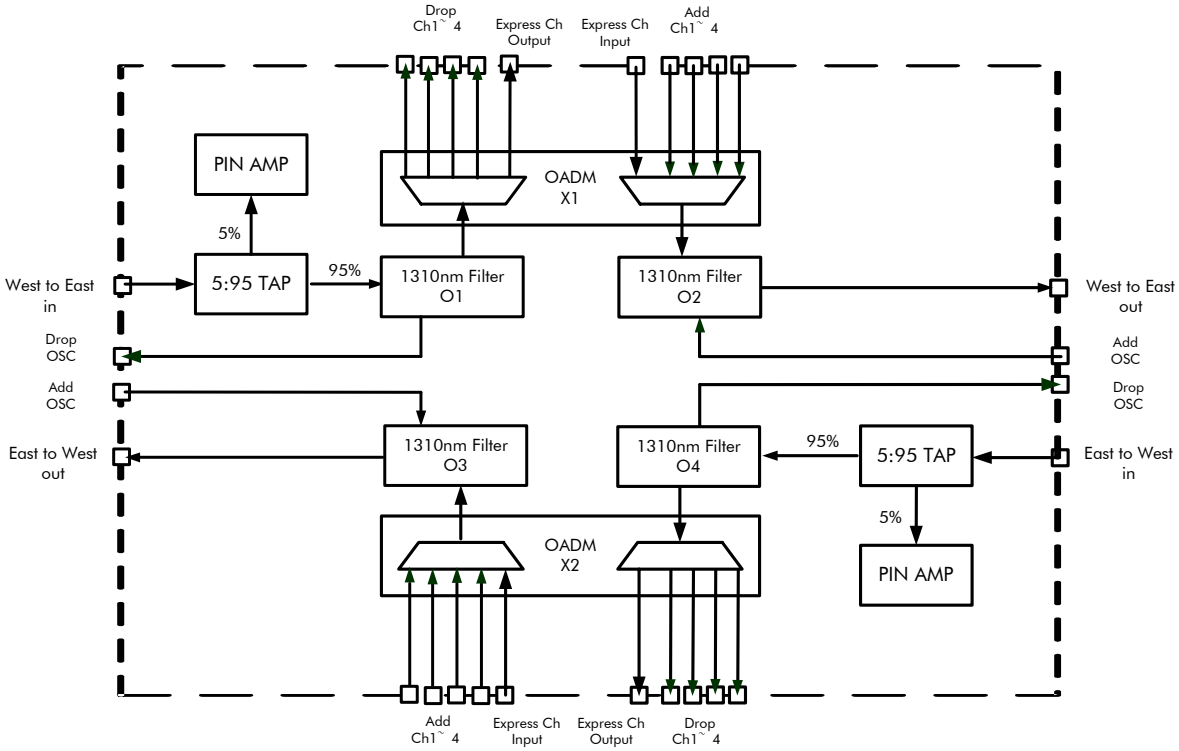

Figure78. C-OAD2-E-U-4-XXXXXXXX-S block diagram

3.4.5.1 Description

This board (C-OAD2-E-U-4-XXXXXXXX-S) is used to add and drop **FOUR Channels** per direction in the unidirectional CWDM system and the added/dropped channels are to/from the transponder board. The other channels are passed through the C-OAD2-E-U-4-XXXXXXXX-S board.

The OSC 1310nm signal is also added/dropped by this board. The dropped OSC signal is sent to the OSC board; the added OSC signal comes from the OSC board.

At each receiving direction, a 5:95 TAP is used to split the line signal into two channels. One (95%) is sent to the OADM module; the other (5%) is sent to a PIN & amplification circuit for LOS detection. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

There are 2 types of 4-channel C-OAD2 boards; the wavelengths are defined in the following table.

The "XXXXXXXX" can be the values listed in the following table.

Table 58.4-channel C-OAD2 module for unidirectional application

Number (XXXXXXXX)	4747494951515353	5555575759596161
Add/Drop Channels (nm)	1470,1490,1510,1530	1550,1570,1590,1610

Thus there are two kinds of C-OAD2-E-U-4-XXXXXXXX-S board.

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3.4.5.2 Front panel description

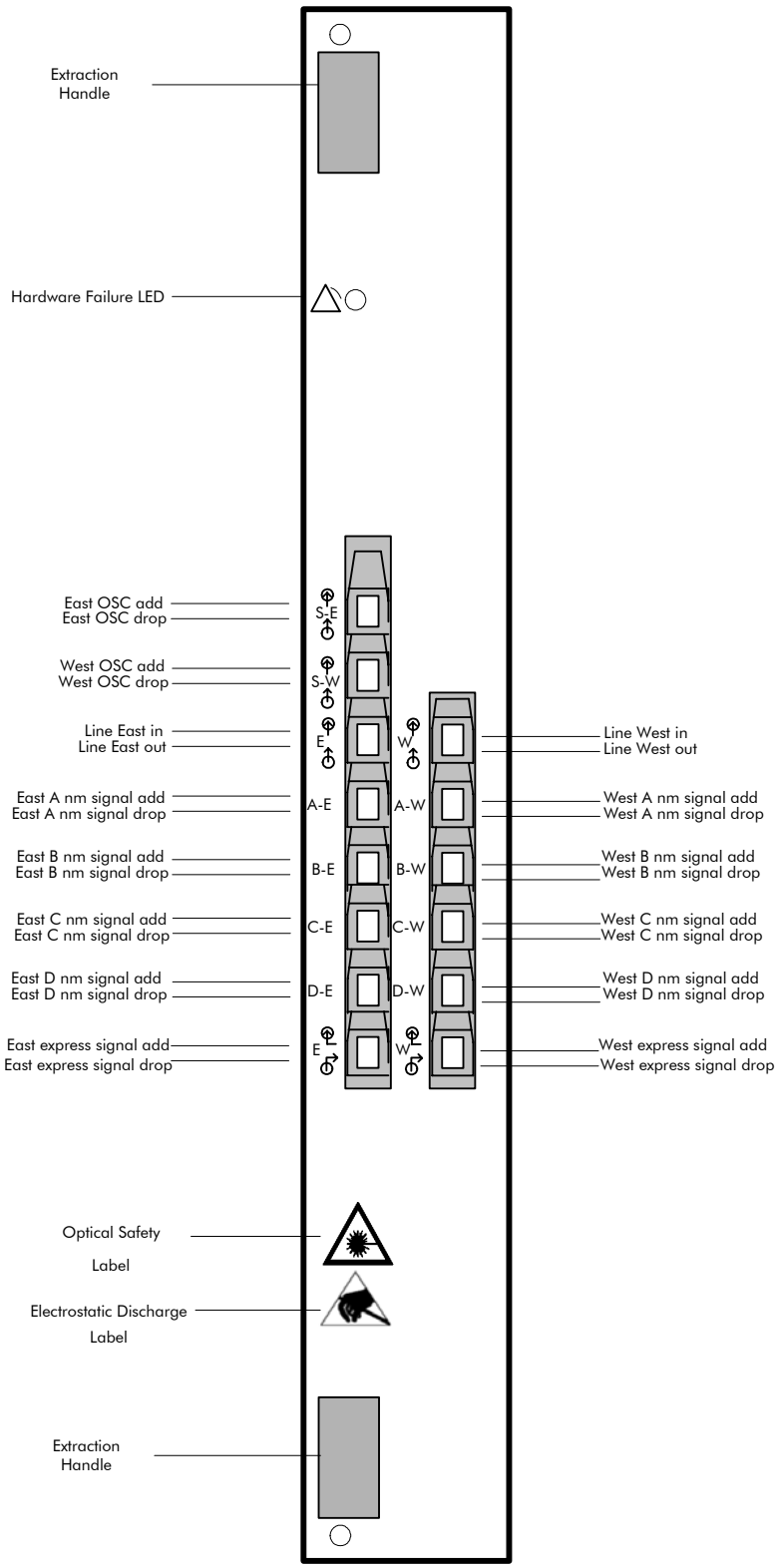

Figure79. Front panel of C-OAD2-E-U-4-XXXXXXXX-S board

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3.4.5.3 Optical characteristics

The C-OAD2-E-U-4-XXXXXXXX-S unit's add & drop channels sequence is defined by the following table.

Table 59.Add & Drop Channels Sequence

Add & Drop Wavelength (nm)		Channel Number
C-OAD2-E-U-4-4747494951515353-S	**C-OAD2-E-U-4-5555575759596161-S**	
1470	1550	1
1490	1570	2
1510	1590	3
1530	1610	4

The optical characteristics of the board are as follows:

Table 60.C-OAD2-E-U-4-XXXXXXXX-S board optical characteristics

Insertion Losses	**Value**	**Unit**
IN->Exp Ch OUT (Max)	2.7	dB
Exp Ch IN->OUT (Max)	2.2	dB
In->CH1 Drop (Max)	2.8	dB
In->CH2 Drop (Max)	2.5	dB
In->CH3 Drop (Max)	2.2	dB
In->CH4 Drop (Max)	1.9	dB
CH1 Add->Out (Max)	1.4	dB
CH2 Add->Out (Max)	1.7	dB
CH3 Add->Out (Max)	2.0	dB
CH4 Add->Out (Max)	2.3	dB
IN->OSC DROP (Max)	1.5	dB
OSC ADD->OUT (Max)	1	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

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3.4.5.4 Front panel wiring

Table 61.Front panel wiring of C-OAD2-E-U-4-XXXXXXXX-S board

Name	Signal
OSC Add (East)	East OSC signal input (From OSC board)
OSC Drop (East)	East OSC signal output (to OSC board)
OSC Add (West)	West OSC signal input (From OSC board)
OSC Drop (West)	West OSC signal output (to OSC board)
Input (East)	East Line signal input (from line)
Output (East)	East Line signal output (to line)
Add A (East)	East A nm signal add (from corresponding transponder)
Drop A (East)	East A nm signal drop (to corresponding transponder)
Add B (East)	East B nm signal add (from corresponding transponder)
Drop B (East)	East B nm signal drop (to corresponding transponder)
Add C (East)	East C nm signal add (from corresponding transponder)
Drop C (East)	East C nm signal drop (to corresponding transponder)
Add D (East)	East D nm signal add (from corresponding transponder)
Drop D (East)	East D nm signal drop (to corresponding transponder)
Express Ch In (East)	East express signal input
Express Ch Out (East)	East express signal output
Input (West)	West Line signal input (from line)
Output (West)	West Line signal output (to line)
Add A (West)	West A nm signal add (from corresponding transponder)
Drop A (West)	West A nm signal drop (to corresponding transponder)
Add B (West)	West B nm signal add (from corresponding transponder)
Drop B (West)	West B nm signal drop (to corresponding transponder)
Add C (West)	West C nm signal add (from corresponding transponder)
Drop C (West)	West C nm signal drop (to corresponding transponder)
Add D (West)	West D nm signal add (from corresponding transponder)
Drop D (West)	West D nm signal drop (to corresponding transponder)
Express Ch In (West)	West express signal input
Express Ch Out (West)	West express signal output

N.B. (A, B, C and D) can respectively be (1470, 1490, 1510 and 1530) or (1550, 1570, 1590 and 1610).

N.B. "East" means from west to east, while "West" means from east to west.

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3.4.6 C-OAD2-U-4-XXXXXXXX

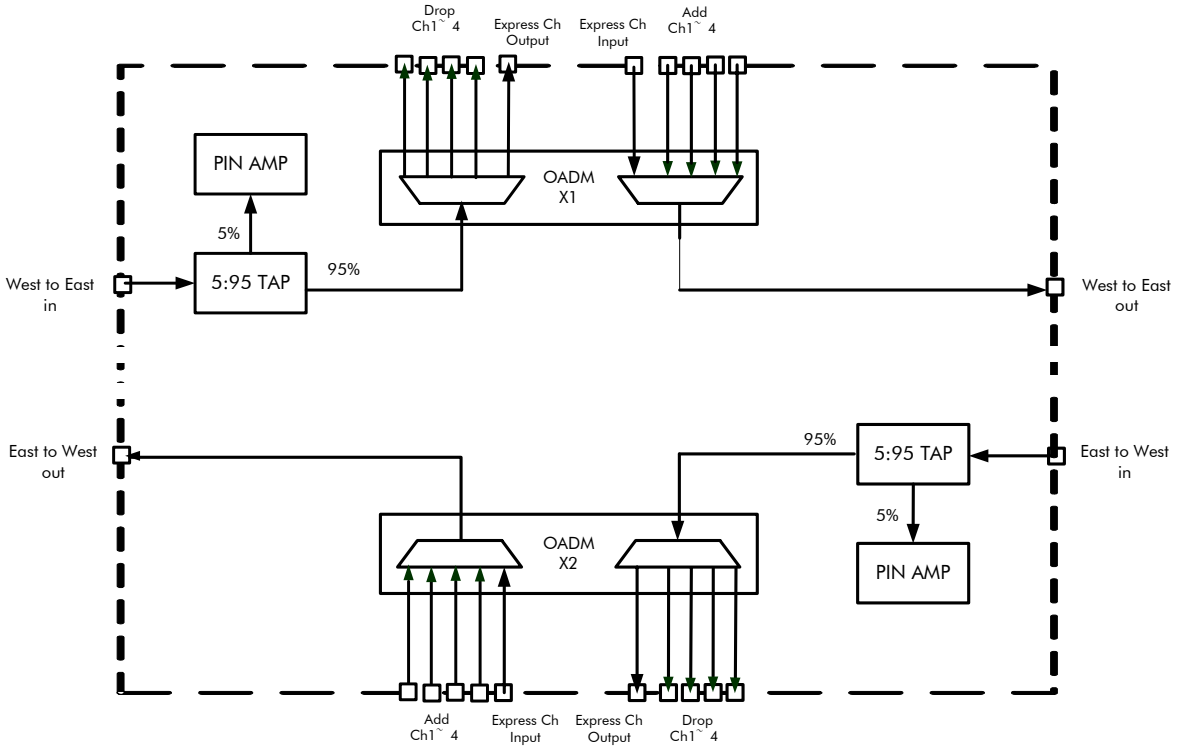

Figure80. C-OAD2-U-4-XXXXXXXX block diagram

3.4.6.1 Description

This board (C-OAD2-U-4-XXXXXXXX) is used to add and drop **FOUR Channels** per direction in the unidirectional CWDM system and the added/dropped channels are to/from the transponder board. The other channels are passed through the C-OAD2 board.

At each receiving direction, a 5:95 TAP is used to split the line signal into two channels. One (95%) is sent to the OADM module; the other (5%) is sent to a PIN & amplification circuit for LOS detection. As R2.0 is passive CWDM equipment, the LOS detection circuit is not available.

There are 2 types of 4-channel C-OAD2 boards; the wavelengths are defined in the following table.

There are two OADM modules (one OADM modules for each direction) in the C-OAD2 board.

The "XXXXXXXX" can be the values listed in the following table.

Table 62.4-channel C-OAD2 modules for unidirectional application

Number (XXXXXXXX)	4747494951515353	5555575759596161
Add/Drop Channels (nm)	1470,1490,1510,1530	1550,1570,1590,1610

Thus there are two kinds of C-OAD2-U-4-XXXXXXXX boards.

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3.4.6.2 Front panel description

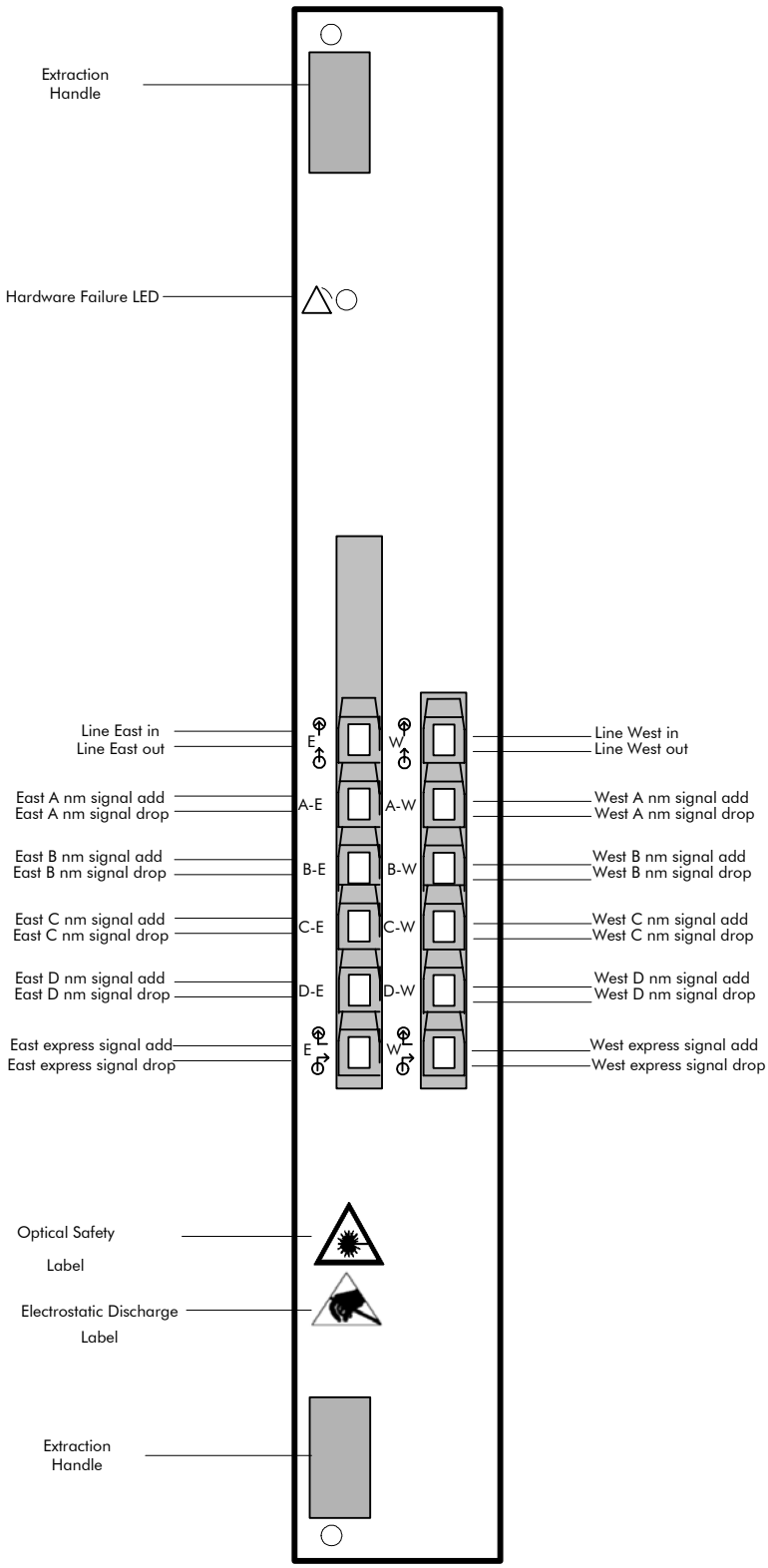

Figure81. Front panel of C-OAD2-U-4-XXXXXXXX board

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3.4.6.3 Optical characteristics

The C-OAD2-U-4-XXXXXXXX unit's add & drop channels sequence is defined by the following table:

Table 63.Add & Drop channels Sequence

Add & Drop Wavelength (nm)		Channel Number
C-OAD2-U-4-4747494951515353	**C-OAD2-U-4-5555575759596161**	
1470	1550	1
1490	1570	2
1510	1590	3
1530	1610	4

The optical characteristics of the board are as follows:

Table 64.C-OAD2-U-4-XXXXXXXX board optical characteristics

Insertion Losses	**Value**	**Unit**
IN->Exp Ch OUT (Max)	2.2	dB
Exp Ch IN->OUT (Max)	1.7	dB
In->CH1 Drop (Max)	2.3	dB
In->CH2 Drop (Max)	2.0	dB
In->CH3 Drop (Max)	1.7	dB
In->CH4 Drop (Max)	1.4	dB
CH1 Add->Out (Max)	0.9	dB
CH2 Add->Out (Max)	1.2	dB
CH3 Add->Out (Max)	1.5	dB
CH4 Add->Out (Max)	1.8	dB
Fiber Specs	**Type**	
Fiber type	0.9/2mm SMF28	
Connector type	MU	
Reflectance	**Value**	**Unit**
All input ports (Max)	-40	dB

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3.4.6.4 Front panel wiring

Table 65.Front panel wiring of C-OAD2-U-4-XXXXXXXX board

Name	Signal
Input (East)	East Line signal input (from line)
Output (East)	East Line signal output (to line)
Add A (East)	East A nm signal add (from corresponding transponder)
Drop A (East)	East A nm signal drop (to corresponding transponder)
Add B (East)	East B nm signal add (from corresponding transponder)
Drop B (East)	East B nm signal drop (to corresponding transponder)
Add C (East)	East C nm signal add (from corresponding transponder)
Drop C (East)	East C nm signal drop (to corresponding transponder)
Add D (East)	East D nm signal add (from corresponding transponder)
Drop D (East)	East D nm signal drop (to corresponding transponder)
Express Ch In (East)	East express signal input
Express Ch Out (East)	East express signal output
Input (West)	West Line signal input (from line)
Output (West)	West Line signal output (to line)
Add A (West)	West A nm signal add (from corresponding transponder)
Drop A (West)	West A nm signal drop (to corresponding transponder)
Add B (West)	West B nm signal add (from corresponding transponder)
Drop B (West)	West B nm signal drop (to corresponding transponder)
Add C (West)	West C nm signal add (from corresponding transponder)
Drop C (West)	West C nm signal drop (to corresponding transponder)
Add D (West)	West D nm signal add (from corresponding transponder)
Drop D (West)	West D nm signal drop (to corresponding transponder)
Express Ch In (West)	West express signal input
Express Ch Out (West)	West express signal output

N.B. (A, B, C and D) can respectively be (1470, 1490, 1510 and 1530) or (1550, 1570, 1590 and 1610).

N.B. "East" means from west to east, while "West" means from east to west.

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MAINTENANCE

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4 MAINTENANCE

4.1 Introduction

The maintenance procedures consist of the following steps:

- Preventive Maintenance
- Unit replacement with a spare

Attaching the units and modules into the subrack

(Caution to avoid equipment damage)
The screw tightening torque for attaching the units (and modules, if any and if fixed by screws) into the shelf must be:

2.8 kg x cm (0.28 Newton x m)± 10 %

Exceeding this value may result in the screw breaking.

4.2 Maintenance Definitions

DEFINITION OF PREVENTIVE MAINTENANCE

Preventive maintenance consists of carrying out a number of operations to minimize the risk of a failure on a link.

These operations can be scheduled or initiated by the equipment supervision system.

DEFINITION OF THE TECHNICAL LEVEL OF THE MAINTENANCE AGENT

It is mandatory for the technicians in charge of the equipment maintenance to be familiar with the measurement techniques used on equipment fitted with optical connectors.

4.3 PREVENTIVE MAINTENANCE

The ALCATEL1692MSE equipment requires no systematic preventive maintenance.

4.3.1 Routine maintenance every year

It is suggested to carry out the following operations yearly:
- Make sure that the shelf has been tightly fastened to the rack with screws to guarantee grounding (the rack is connected to the station ground).

4.3.2 Other routine maintenance

When there is much dust attached on the shelf, it will confine equipment working.
It is suggested to clean the shelf every month.

4.4 Unit replacement with a spare

No particular direction is given as to spares handling, which is left to the Maintenance Administration.
When the replacement procedures are executed, set the spare unit exactly as the unit to be replaced.

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4.5 Repair Form

To facilitate repair operation, data on the faulty unit must be reported on the form shown in the following figure.

The repair form must be filled-in with as much data as possible and returned to Alcatel together with the faulty unit.

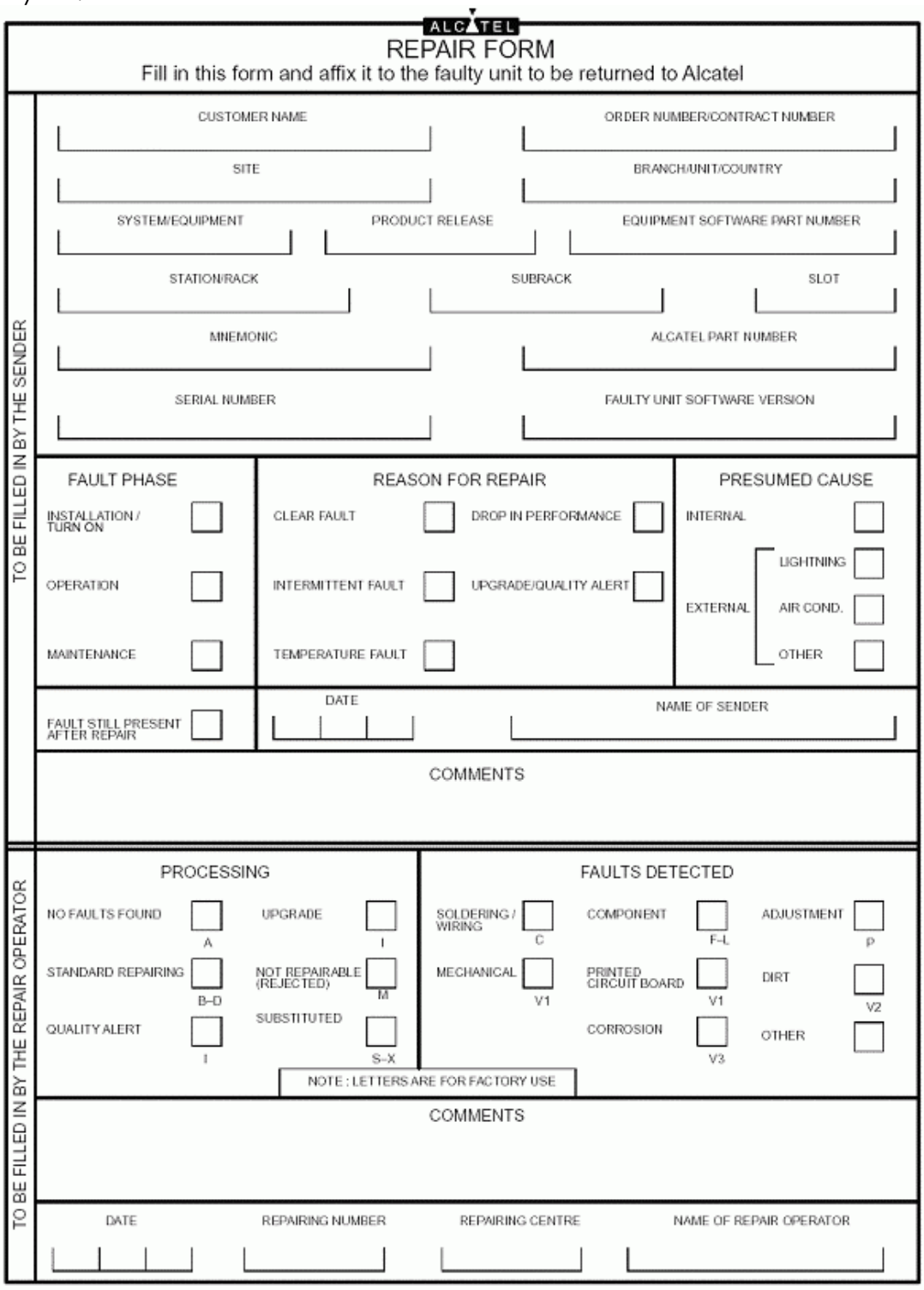

Figure82. Repair form

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